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WPB Reduces Over-All Production of Paper

Requirements Committee Determines Output At 1,400,000 Tons For First 1944 Quarter Or 2.3 Per Cent Below Average In Third 1943 Quarter — Minimum Is 9 Per Cent Under Mills' Estimate.

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., Dec. 29, 1943.—The War Production Board announced today that its Requirements Committee has made determinations of the paper and paper board to be produced during the first quarter of 1944.

Over-all U. S. paper and paperboard production during the first quarter of 1944 is estimated at approximately 1,400,000 tons per month, or about 2.3% below the average monthly production in the third quarter of 1943. Proposed minimum production is, however, about 9% less than that estimated per month in the first quarter by the mills. The program determination was issued by the program vice-chairman, J. A. Krug, who is also chairman of the Requirements Committee.

The report to the Requirements Committee by the Forest Products Bureau indicated that for the past 14 months inventories of pulp and pulpwood have been diminishing and are now at a minimum practical operating level. The domestic wood pulp consumption that was established for the first quarter is designed to arrest the declining inventories of pulp and pulpwood. Pursuant to this program determination, the paper and paper board mills will be requested, in the first quarter, to produce from quantities of pulp not to exceed the determined minimum for each grade, the maximum amounts of the various grades of paper and paper board. It is proposed that this be done through the use of waste materials and fillers, and by encouraging and directing, wherever practicable, the production and use of lighter weights of paper.

The program determination was made on the basis of extensive preliminary considerations by the Forest Products Bureau, the various claimant agencies, including the Army, Navy, War Food Administration and Office of Civilian Requirements, and the Industry Advisory Committees made up of members of the paper and paperboard industry.

More Pulp for Direct Military Use

The limitations on the maximum amounts of pulp that can be allocated for the production of various grades of paper and paper board under the program determination will permit the use of diversion of very substantial amounts of wood pulp for direct military non-paper uses such as explosives, high-tenacity rayon programs, and other essential civilian non-paper uses. The exact quantities of the pulp to be available for these other purposes will be determined shortly by the Requirements Committee.

The program determination for the production of paper and paper board during the first quarter of 1944 was made to assure that military and essential civilian needs be met. To accomplish this objective, statements of requirements were requested from the claimant agencies, and, in addition, the application forms from the paper and paper board producers required that the applicant show proposed use of pulp in terms of major end-use categories. From these data, the relative essentiality of the various classifications of paper and paper board products permitted a determination to be made and indicated the amount of pulp and the authorization of paper production for each classification of paper and paper board.

To effectuate this program determination, the Requirements Committee, speaking through Program Vice-Chairman Krug, directed that pulp be allocated under WPB Order M-93 not to exceed the amounts specified, earmarked for use in the manufacture of particular types of paper and non-paper products, and that the appropriate limitation orders governing consumption of these products be issued or continued. The program determination expressly approved the proposed limitations on consumption of paper that have been announced for incorporation in Orders L-240, L-241, L-244, and L-245, concerning newspapers, commercial printing, magazines, and books, respectively.

Output to be 9% Under Mills' Estimate

The over-all level of paper and paperboard production provided by the terms of the program determination will be approximately 9% below the average monthly production proposed by the paper and paper board mills for the first quarter of 1944. The pulp required to support such production, it is stated by representatives of the Forest Products Bureau, will not endanger pulp and pulpwood inventories, and will meet the requirements of the military services and

(Continued on page 12)

Canada Sets New Pulp and Newsprint Output

Wartime Prices and Trade Board Announces New Production Schedules Below Preliminary Production Figures — Rates Apply To First Six Months of 1944 — Pulpwood Situation Is Improved.

[FROM OUR REGULAR CORRESPONDENT]

MONTREAL, Que., December 20, 1943.—The Prices Board has announced new production and supply schedules for newsprint and wood pulp for the first six months of 1944, according to which the supply of newsprint for the United States will be cut by approximately 10,000 tons per month and that for domestic consumption by 600 tons, while in response to urgent requests from the United Kingdom, supplies will be increased for overseas consumption, due to the changing needs caused by war developments. It is stated that owing to some improvement in the pulpwood cutting situation, the production schedules are higher than was thought possible a month or two ago. It is also intimated that the whole situation will be reviewed again when actual production figures are available for the current pulpwood cutting season, which will be around the end of April.

As announced, production for the first six months of 1944 will be at a monthly rate of 252,900 tons—200,000 tons for the United States, 15,400 for Canada and 37,500 for overseas.

Reduction from Announced Quotas

The announcement did not include comparative figures of present production and consumption but a spokesman said the new United States total was a reduction of 10,000 tons from the 210,000 tons currently supplied that country each month while Canadian consumption will be reduced 600 tons from 16,000.

While totals for current overseas shipments were not immediately available the spokesman said the board had increased the tonnage allotted for overseas markets in response to requests from United Kingdom and other Empire consumers for additional supplies of Canadian newsprint.

The Canadian Newsprint Association reported shipments to the United Kingdom during the first half of 1943 were at a rate of 18,844 tons a month. This figure, however, did not include shipments to other Empire countries, which are included in the new 37,500 quota for overseas. There was no break-down available for the new total.

U. S. to Get 91,666 Tons of Pulp Monthly

Wood pulp shipments to the United States during the first six months of next year will be at an annual rate of 1,100,000 tons—91,666 tons a month.

The contemplated 200,000-ton monthly shipment to United States publishers from Canadian mills is considerably above the 182,000 tons a month which had been scheduled on the basis of earlier low forecasts of the wood cut this season.

It compares with about 210,000 tons a month received during the last year from Canada, which supplies more than 70% of United States newspapers' newsprint.

On the basis of a total wood cut this season of about 6,500,000 cords, United States publishers had been warned their supplies in the first quarter of 1944 would be as much as 24% under the base period of 1941.

At the time the 24% cut was outlined, however, War Production Board authorities made it clear that any subsequent improvement in the wood supply or reduction in other essential demands for pulpwood would be to the benefit of newsprint users.

"The proposed schedule for production and shipment, beginning January 1, will provide for essential Canadian requirements at curtailed levels and for highly essential shipments to the United Kingdom and other overseas markets . . ." the statement said, quoting R. M. Fowler, the Prices Board's general counsel and secretary.

While the board's statement said production rates have been set only for the first six months of 1944, it added:

Whole Situation Must Be Reviewed

"Every effort will be made to continue these levels but the whole situation will have to be reviewed in the light of actual pulpwood production figures for the current cutting season when these figures become available about the end of April next."

"Shortage of pulpwood was indicated some six months ago by a shortage of labor in the woods," said Mr. Fowler.

"In the interests of Canadian domestic supply and at the urgent and repeated request of the War Production Board in Washington . . . the Canadian Government took a number of steps to improve the labor supply in the woods so as to maintain production at the highest possible levels.

"In this connection the work of National Selective Service has been particularly effective and the producing industry in Canada has also taken all practicable steps to enlarge the supply.

"As a result, pulpwood production during the current cutting season has improved, and while some curtailment is still necessary and serious shortages still persist in some producing areas, the Prices Board has been able to set production levels for the first six months of 1944 somewhat higher than could have been justified a few months ago . . .

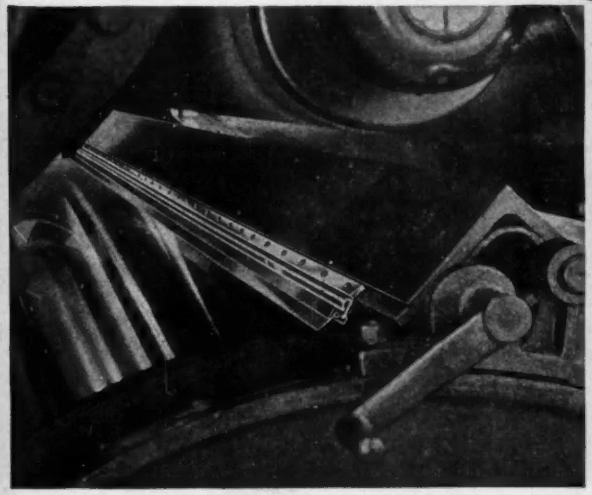
"The particular distribution of the pulp shipments between all kinds and grades of pulp will be the subject of further discussions with the War Production Board.

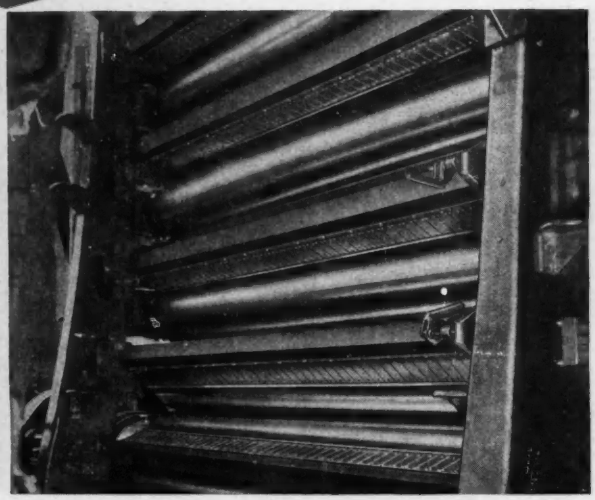
Give Party for Service Men

BOSTON, Mass., December 27, 1943—With the servicemen from Storrs & Bement Company stationed nearby and wives of those who are overseas or away from Boston as guests, that firm gave a delightful Christmas Party to the entire staff on Friday. At the dinner, William N. Stetson, Jr., president and treasurer, greeted the employees, expressing good wishes from the company. Paul Jones, sales manager, addressed the group in his usual good form.

The New Haven, Conn., branch of the company had a Christmas Party on Wednesday.

VICKERY DOCTORED ROLLS Like These





are helping to make better paper and more of it per day at lower cost per ton—and they're doing it with a minimum amount of manpower for maintenance . . . Keep your Vickery Doctors on the job. Get in touch with us any time you have any question about paper doctoring.

BIRD MACHINE COMPANY
SOUTH WALPOLE • MASSACHUSETTS

Canada Drives on for More Pulpwood

Reports From Some Sections Are Encouraging But Harvest In First Four Months of Current Season Is 25 Per Cent Under Same Period Last Year — Paper Concerns Cut Funded Debt — Other News.

[FROM OUR REGULAR CORRESPONDENT]

TORONTO, Ont., December 27, 1943—An intensive campaign is under way to secure a larger supply of wood for pulp and paper mills. Reports from some districts are a little encouraging, while other sections are not so optimistic. The over-all picture at the end of this week will, it is expected, determine to what extent production next year will be maintained. The first of the estimates on Canada's pulpwood supply for 1944, and on which newsprint operations will be based, will be available over the week-end. No advance information is available, but it would not be surprising to many if the announcement, when it comes, indicates a wood supply insufficient to maintain paper mill operations at current levels.

Results of the first four months of the current cutting season indicated a decrease in pulpwood output of 25% below the same four months of a year ago. However, there is some indication that there are now in the woods approximately as many men as there were last year and it is expected that the balance of the cutting season may show a more favorable situation.

What Present Rate of Cutting Indicates

At the rate of cutting in the last few months there would be only 5,850,000 cords of pulpwood available for conversion by Canadian mills in 1944. The pro rata share of newsprint which the United States would receive at such a level would be 162,000 tons a month, whereas a goal of 182,000 tons a month has been set by the U. S. for the first quarter of the new year. Should production of pulpwood increase to permit greater shipments, Canada has agreed to increase the U. S. quota proportionately in newsprint, wood pulp and pulpwood exports.

In the meantime, comfort is taken from the fact that operations of Canadian newsprint mills in November were on practically the same level as in October and for the second time this year ahead of the like period last year in respect to both output and shipments.

Paper Companies Cut Funded Debt

Listing Abitibi Pulp and Paper Company, Consolidated Paper, Great Lakes Paper, Minnesota and Ontario, Price Brothers, and the Brown and Fraser companies, it is found that these seven leading concerns of the Canadian pulp and paper group, at the end of 1942, increased net working capital to well over three times that at the end of 1937, and reduced the combined funded debts by $50,112,135.

These companies, at the end of 1942, had net working capital of $89,150,272, compared with $27,374,639 at the end of 1937. During the same period funded debts were reduced from $185,930,700 to $135,818,565. Taking the two items combined, an improvement is indicated of $111,887,769.

In connection with these figures, however, it should be noted that while Abitibi's funded debt was cut $11,101,410 and net working capital was lifted by $19,423,701, no interest was paid on the bonds outstanding. In the case of Brown Co., the reduction in funded debt was the result of reorganization. The reduction in Consolidated Paper Company's funded debt includes bonds held in anticipation of the sinking fund. In the case of the Great Lakes Paper, $15,200,000 of a reduction in the funded debt of $19,179,100 was effected through reorganization. Reduction in Fraser companies' funded debt included the Restigouche Co.

Cites Rationing Effects on Newspapers

An interesting cable comes from London, Eng., to the Financial Post, Toronto, regarding the effects of rationing on newspapers and magazines in the Old Country. As is well known, rationing of newsprint was ordered soon after the war started, which compelled newspapers not only to reduce their size but to peg their circulation as well. Circulation was pegged at the average for the three months preceding the war. As the war progressed, the splitting up of families, the intake of women by factories, the creation of huge military camps and the arrival of overseas troops, the demand for newspapers was soon far above normal. By agreement, all promotional schemes were taboo. The cost of production was brought down by using a miniature size and the scrapping of the sporting editions. Supplies were quickly exhausted and newspapers all urged their readers to hand copies around. Then Brenden Bracken played an unintentional joke. He announced there would be an additional ration of newsprint, but that it could only be used to increase the numbers and not the size of newspapers.

The Times, Telegraph, Express and Daily Mirror took up their full quota which was absorbed at once by public demand, but the left wing Daily Herald and News Chronicle as well as the right wing Daily Sketch and Daily Mail found they did not need any heavy extra supplies. The Sunday newspapers had much the same experience. The News of the World, now selling five million copies every Sunday, took its extra ration in one gulp. So did the high-toned Sunday Times. Some of the others had to say they were not feeling like an extra helping.

Bulkley, Dunton Publishes Bulletin

To keep its own staff informed, and as a service to its customers and business friends, the Bulkley, Dunton Pulp Company is issuing a new company bulletin. This publication gives a highly-condensed resume of news items in the pulp, paper and board industry. The editorial preface states that the bulletin does not attempt to be all-inclusive in its coverage, and neither does it wish to compete with other publications that serve the interest of the industry.

The bulletin calls the attention of its readers to some particular articles in trade journals. There is a book review and a section devoted to news from abroad.

Diamond Chlorine at war

helps America's Victory Drive!

Chlorine Helps Make Bombers

In building a bomber, approximately one ton of Chlorine is used—in electric wire insulation, in plastics, for cooling motors, in cleaning metal parts during manufacture.

For Smoke Screens

Chlorine is used as an ingredient in the manufacture of smoke screen materials, widely used by ground and air forces as well as in naval warfare.

Defense Against Poison Gases

The best decontamination agents developed to date are Chlorine compounds. Uniforms and equipment are thus protected against war gas, and also decontaminated after exposure.

Dyes for Every Uniform

In the tremendous and exacting job of providing dyes for uniforms and clothing, as well as for other fabrics, Chlorine plays an important part.

Medical Supplies Use Chlorine

In the preparation of the life-saving Sulfa drugs, Chlorine is part of the product. Chlorine is used to manufacture bromine, used for medical purposes.

Field Water-purifying With Chlorine

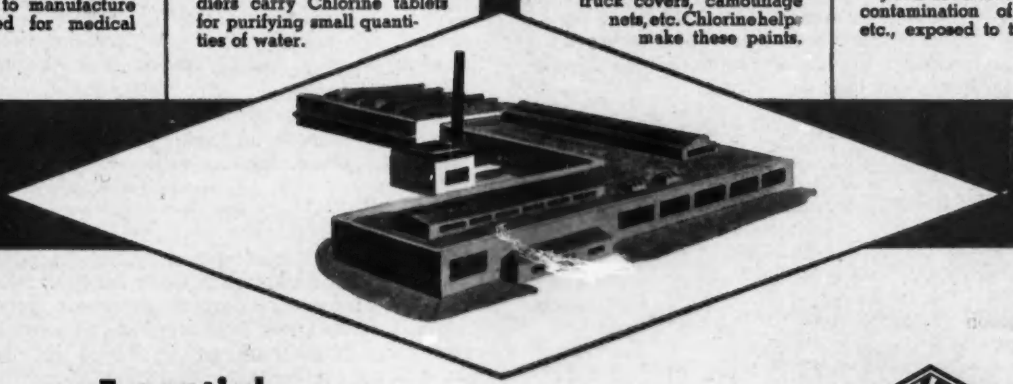
In the field, portable chlorinators have proved of great value. In addition, our soldiers carry Chlorine tablets for purifying small quantities of water.

Flame-retarding Paint

An important and timely development has been flame-retarding paint and coatings for tents, tarpaulins, gun and truck covers, camouflage nets, etc. Chlorine helps make these paints.

Chemical Warfare

The versatility of Chlorine is demonstrated by the fact that it is required in all war gases—yet is the best agent for decontamination of materials, etc., exposed to these gases.



Essential for industrial mobilization, too

All along the industrial front, Diamond Chlorine serves in many vital roles. It helps bleach and refine the pulp needed for blueprint and other papers—and for explosives! In the manufacture of the plastics now used in place of more critical materials, Diamond Chlorine is used. It refines metals and alloys—helps keep power plants running by eliminating algae and impurities that reduce the efficiency of condensers and other units.

Never before have the dependable uniformity and purity of Diamond Chlorine been of greater value than today!

ALKALI

DIAMOND ALKALI COMPANY

PITTSBURGH, PA., *and Everywhere*

WPB REDUCES OVER-ALL PRODUCTION OF PAPER

(Continued from page 7)

essential civilian needs. Further, it should be noted that by the ever-increasing use of waste materials in the paper and paper board production, it is possible that there will not be an equivalent (9%) lag in paper and paper board tonnage produced. The paper and paper board industry, through the exercise of its ingenuity and enterprise, should be able to find ways and means of relieving the shortage of pulp and should produce quantities of paper and paper board in excess of those stipulated in the program determination.

Paper Board Production About the Same

Under the general classification of "Paper Board," the proposed production will be almost the same as the proposed production of the mills and about the same as the third quarter of 1943 production. This is because war packing and shipping requirements are in increasing demand in this field. With the exception of kraftboard, most paper boards are manufactured principally from waste products. Kraftboard is made chiefly in the South and is dependent upon current receipts of wood at the paper and paper board mills. The program determination provides for a 4% curtailment in the use of pulp for the production of kraftboards, but there will be no reduction in "V" boxes, used exclusively in the war effort.

Will Mean Additional Curtailment

The curtailments called for in this program determination will be in addition to those which previously have been obtained in certain classes of paper. For instance, in the coarse paper field, kraft wrapping paper was reduced in the third quarter of 1943 to a point approximately 40% below the 1942 average, and for the first quarter of 1944 is taking a further reduction. Book paper was cut in the third quarter of 1943 about 7.5% and is being substantially reduced again.

Pulp Allocated to Paper Products

During the first quarter of 1944, the WPB program determination calls for the production of a minimum of 1,398,837 short tons of the following types of paper and paper board to be produced each month from 837,060 short tons of pulp:

Types of Paper	Minimum Anticipated to be Produced in Tons	Wood Pulp Allocated in Tons	Ratio of Pulp to Product
Paper			
Coarse	157,190	155,618	99.0
Book	114,732	78,707	68.6
Building Papers	77,137	12,573	16.3
Fine	74,178	62,755	84.6
Special Industrial	21,270	13,998	64.3
Newsprint	60,000	60,780	101.3
Groundwood	44,784	45,232	101.0
Multi-Wall	29,000	30,247	104.3
Sanitary	66,434	65,437	98.5
Tissue	13,428	13,334	99.3
Absorbent	7,616	4,973	65.3
Paperboard			
Container Board	363,447	199,096	54.8
Folding Boxboard	167,801	40,104	23.9
Building	76,585	36,788	48.0
Set-up Boxboard	63,016	592	.9
Cardboard	4,438	1,741	39.2
Other Paperboard	57,281	15,085	26.3

The Forest Products Bureau is authorized to transfer not more than 50,000 tons of pulp during the first quarter from the amount assigned to make container board, to mills making coarse paper products, including wrapping and bag paper, if it appears an adjustment is warranted.

A maximum reserve supply of pulp approximating 69,000 tons per month for the first quarter, has been established for export and non-paper uses, in addition to the amounts specifically allocated in the table set out above.

No Mystery or Miracle in Deinking

When we send our soiled linens to the laundry, we expect the laundryman to "de-soil" them. Our laundry bundle consists of cellulose materials—and paper is basically similar. So when we wish to "deink" paper, we are faced with a problem similar to that of the laundryman, though not quite as simple a one. Both techniques include the use of alkalies and detergents.

Laundry experts know that certain fabrics cannot be cleaned safely with strong alkalies, while others are not injured when cleaned with a solution containing a high alkalinity. They also know that better results are secured when the alkalies are buffered to prevent destructive effect on the fiber without hindering the detergent action. In addition, some medium must be used to hold the soil in suspension so that it will not re-deposit before rinsing.

The superintendent of a deinking plant knows the necessity of sorting his waste paper, since different grades or kinds of paper require different treatment to obtain the best results for his product. He knows that the mechanical methods to be used are important; that temperature control and the time element must enter into his calculations; that in fact the same careful operations used in the manufacture of fine paper are required to insure the best results in a deinking plant.

Most of the chemical elements used in deinking are common and of low cost and paper manufacturers have been using them successfully for years. Occasionally a new chemical is found that, when used with the alkalies, makes better control possible and aids in the process of deinking. To produce a better quality of finished paper without increasing the cost of operations, is a distinct advantage to the manufacturer.

A few years ago the Kinsley Chemical Company approached the subject of deinking from the viewpoint of laundry practice, and its studies were devoted to the development of a chemical that would improve the quality of the deinked stock without increasing the cost of manufacture. The company's success in this effort has resulted in a low cost chemical product to be used in combination with properly balanced alkalies, and has yielded several important improvements in the quality of the stock. The wetting and penetrating action makes the fiber more accessible to the alkalies and increases their effectiveness. The pigments, or colors, when dislodged, are held in suspension so that the stock will wash out cleaner. This fact, and the buffer action of the chemical in preventing discoloration, combine to reduce the bleach requirement, thus insuring a stronger stock.

An extensive experience with this chemical has demonstrated its value to the paper manufacturer.

NEW HORIZONS !

• The impact of peace will be great. Conversion and adjustment to pre-war production and competitive markets present difficult problems. Executive skill of the highest degree must be exercised to permit no gaps of lost effort. Truly a momentous task lies ahead for those who direct the paper industry of this nation.

This step, however, will be taken with confidence. A confidence that is deeply rooted in their minds and hearts. Defined it is this -- that the integrity and resourcefulness and the products of the Bagley and Sewall organization will be theirs to command. Over a half century of service to the paper industry by this company has built an enviable reputation of accomplishment and service unequalled.

THE BAGLEY AND SEWALL COMPANY : WATERTOWN, NEW YORK

Obituary

Thomas Utegaard

Thomas Utegaard, who took a leave of absence as civil engineer for the Consolidated Water Power and Paper Company, Wisconsin Rapids, Wis., last February to accept a commission as a lieutenant commander in the United States Navy, died Friday of last week at the naval hospital at Brooklyn, N. Y. He had been a patient since last May, suffering from a disease that was diagnosed then as fatal.

Mr. Utegaard left a position as city engineer at Janesville, Wis., September 1, 1920, to become associated with the Consolidated organization. He designed and supervised construction of some of the largest expansions and projects of the company such as the large addition to the main mill at Wisconsin Rapids, the new plant for the Ahdawagam Paper Products Company, an affiliate at Wisconsin Rapids, and the huge new Du Bay dam and power plant on the Wisconsin River.

A graduate of engineering at the University of Wisconsin, Mr. Utegaard also had the distinction of serving in both World Wars. He enlisted as a private in the army at Columbus, Ohio, in 1917 following his graduation, and later entered an officers' training school at Camp Grant, Ill., where he was commissioned a second lieutenant. He served overseas for nine months in France as an officer in the 56th Coast Artillery. He was married in New York City just prior to departure for France to Miss Alizabeth Fletcher.

Reporting for duty in the present war late in February, 1943, at Norfolk, Va., he took preparatory training there for service with the overseas branch of the navy's Seabees. He had served as public works officer of the Navy's port at Bayonne, N. J., however, where he was taken ill.

Two of the surviving sons are also in the service, Thomas F. at the Naval Academy at Annapolis, and John in the Marine Corps at San Diego, Cal. Survivors also include his widow and another son, Rolf. A brother, Olin, also is in the navy.

Mr. Utegaard was born at Eau Claire, Wis., December 9, 1893. He was a member of The American Legion and the American Society of Civil Engineers.

Charles H. Noble, Sr.

Charles Henry Noble, Sr., 62, of 3918 South Westnedge avenue, former superintendent of the King and Rex Paper mills, died December 24 at Bronson hospital after a day's illness.

Mr. Noble, a resident of Kalamazoo 50 years, was district manager for the A. E. Staley Manufacturing Company of Decatur, Ill., at the time of his death. He had a long record as a paper mill superintendent, his career starting with his first job at the MacSim-Bar paper mill in Otsego at the age of 14.

Two years later he came to the King Paper mill in Kalamazoo and worked his way up to mill superintendent. He left his position there to help the late John King build the Rex Paper Company and served in the capacity of superintendent of that plant until 1915. He served with paper manufacturing companies of Elkhart, Ind., and Taylorville, Ill., and in 1920 went with the A. E. Staley Manufacturing Company of Decatur, Ill., and was a district manager for that concern 23 years.

His death followed by only three months that of his brother, Edward Noble, also a well known paper company superintendent, who died Sept. 16.

Surviving are his widow, two sons, two daughters, one brother and a sister.

Robert D. Howerton

It is with deepest regret that the management of Calco Chemical Division, American Cyanamid Company, makes known the passing of Robert D. Howerton. A member of the sales staff for some years, Mr. Howerton has been western sales manager at Chicago for the past two years.

Born in Lexington, Va., he was educated in local schools of that city, and attended Washington and Lee, from which university he received his Bachelor of Science degree in 1922. Prior to his association with the firm, he had been identified with textile dyeing and finishing business in the South, and for some time after joining Calco, he was a sales representative in that territory.

Mr. Howerton is survived by his wife, Mildred Lubbock Howerton, sons, Robert and Philip, and a daughter, Frances.

C. M. Baker

C. M. Baker, who had served the National Paperboard Association for a number of years as consultant on stream improvement matters died Saturday evening December 18 at Madison, Wis., following a heart attack.

Mr. Baker was a member of the Technical Association of the Pulp and Paper Industry.

The funeral services were held at Madison, Monday, December 20.

Guy Howard

Guy Howard, consulting engineer for the Marathon Paper Mills of Rothschild, Wis., died Sunday of a heart attack. He was born at Batavia, N. Y., on August 26, 1879. He was graduated from the University of Nebraska in 1900, receiving his Master's degree from Columbia University in 1905. He had been a member of the Technical Association of the Pulp and Paper Industry since 1915 as well as several other professional associations.

Niagara Alkali Wins Second "E"

The Niagara Alkali Company has been honored for the second time with the Army-Navy Production Award for meritorious services on the production front.

In the notification sent by Robert P. Patterson, Under Secretary of War, he stated: "You have continued to maintain the high standard that you set for yourselves and which won you distinction more than six months ago. You may well be proud of your achievement."

A White Star now will be added to the Niagara Army-Navy "E" flag which was presented to the company during a ceremony at the Niagara Falls plant about six months ago.

The first plant for the manufacture of liquid chlorine in the United States was set up by the Niagara Alkali Company, and they were also the first in this country to produce caustic potash, flake caustic soda and carbonate of potash.

This drive saves

as much as $1.20 PER TON of board

A substantial part of paperboard cost lies in the cost of felt. But when felt has to act as a belt to drive auxiliary rolls, water removal and formation qualities have to be sacrificed to give the felt mechanical strength. The result is a compromise felt design with shorter life. Shutdowns for replacement are frequent, water removal is less and sheet formation is improper. Yet, all of these disadvantages can be eliminated.

With the Westinghouse wet-end auxiliary drive, the felt is relieved of loads and the conditions at the roll nips are ideal for proper sheet formation. Felt life is longer and paper quality is better.

Furthermore, water removal cost is less. The water removal ability of felt goes up as its mechanical strength goes down. With wet-end drives, better felt can be used since mechanical strength is no longer a factor. You save because it costs from 8 to 14 times more to remove water at the driers than at the wet end. Users claim as much as $1.20 per ton of board saved with this drive.

Complete information about this improved drive is contained in a new booklet just published. Write today for your copy of B-3275. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., Dept. 7-N. J-94606

GET THIS BOOK—

Tells How You Can . . .

- Increase Felt Life
- Improve Paper Quality
- Lower Production Cost
- Increase Water Removal
- Get Better Formation
- Reduce Shutdowns
- Increase Production

Westinghouse

PLANTS IN 25 CITIES... OFFICES EVERYWHERE

Wet End

AUXILIARY MOTOR DRIVES

U. S. to "Stockpile" Newsprint

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., Dec. 29, 1943—Newsprint that may be available for shipment from Canada to the U. S. in excess of 182,000 tons per month during the first quarter of 1944 will be purchased by U. S. Government authorities for use as a stockpile to insure adequate supplies of newsprint for the second half of 1944, it was announced today by Donald M. Nelson, chairman of the War Production Board.

This additional measure of protection to the newsprint supply has been made possible, Mr. Nelson said, by the decision of the Canadian Wartime Prices and Trade Board to make available to the United States 200,000 tons per month in the first six months for 1944 instead of the 182,000 tons per month previously proposed as the maximum that could be made available.

The following statement by Harold Boeschenstein, acting director of the Forest Products Bureau of the War Production Board, was issued in connection with this announcement:

"I am pleased to receive from Canadian authorities the encouraging information that pulpwood production has improved during the current wood cutting season and am gratified at this response to our repeated urging. The United States will gladly accept any newsprint in excess of the 182,000 tons maximum estimated by Canadian officials in November when they were pessimistic concerning their ability to continue to supply newsprint at even that level. At the same time, minimum shipments of pulpwood and pulp, so necessary to our essential military program and our other civilian paper requirements, must be maintained.

"We prefer that Canadian authorities allow us the benefits of this increased wood production proportionately in pulpwood, pulp and newsprint. This would give us more flexibility in meeting shortages which are very serious in other paper products and certain highly important military non-paper uses. This the Canadian authorities agreed to do in November, and with that understanding, the War Production Board is imposing the necessary restrictions on all branches of the graphic arts industries on an equitable basis.

"The Canadian commitment to furnish newsprint to the U. S. at the level of 200,000 tons a month is limited specifically to the first six months of 1944. The best assurances we have been able to obtain from Canada concerning the 1944 shipments of pulpwood and pulp, so important to other production programs, reflect serious decreases from 1943 levels —decreases that are substantially greater than their revised estimates for newsprint. We are still hopeful that the situation with respect to these items, too, will improve. We shall continue to encourage in every proper way increased Canadian production of pulpwood and its equitable use for other essential products as well as for newsprint.

"We propose to conserve the tonnage gained through the improved outlook in newsprint supply, so that in the second half of 1944 our newspapers and other essential users of paper may have a reserve to fall back on should production in the second half be less favorable. Therefore, the War Production Board, in accordance with the determination of its Requirements Committee, will issue limitations orders on the basis previously recommended by the various printing and publishing industry advisory committees. By stockpiling during the first quarter of the year any excess in newsprint over 182,000 tons per month which the Canadian newsprint industry may supply to us, we hope to stabilize the newsprint situation for once and for all. By so doing we will in large measure remove the disheartening uncertainty caused by steadily declining inventories and consistent deterioration in wood supply under which our graphic arts industries and other industrial groups dependent upon Canadian imports have operated in the last year.

"If Canadian deliveries of newsprint, as now anticipated, are forthcoming without depleting wood inventories further, the application of these measures of limitation will place the newsprint-using industries in a sounder position to meet the unpredictable needs of the second half of 1944 than it has known at any time in many months. The willing cooperation of the great majority of newspaper publishers in the U. S. is and will continue to be a major factor in making this possible.

"Newspapers may be sure that the War Production Board will make every effort to provide a continuity of newsprint supply in maximum amounts, giving due regard, of course, to the military and civilian requirements for other paper and non-paper products made from pulp and pulpwood."

Dorr Co. Expands Westport Mill

An extension to the Westport mill of the Dorr Company is being completed which will increase the number of research laboratories and will provide an additional wet laboratory for specialized Dorr work. The principal new accession is the Semiworks, in which has been provided a large open area with floors at various levels, ample headroom and a flexible design for handling material and equipment with maximum ease. All the basic services for metallurgical and chemical operations are to be provided, and apparatus as required will be set up in the Semiworks for specific flowsheets, offering a concrete embodiment of a full-scale plant. "Semiworks" most aptly describes the scope of the work to be undertaken; it could also be called a "Semicommercial" Laboratory. Activities will range from the demonstration of a single item of equipment through that of a single station or unit, to the actual operation of continuous pilot plants for demonstrating new processes, making small quantities of new products, or for proving a method of treatment for special ores or materials. Up to 3,000 gallons per minute of water may be drawn from the adjacent pond for hydraulic studies.

The Westport mill personnel represents broad training and plant operation experience, giving Westport practical as well as technical viewpoints on the problems put before them. The staff includes chemical, metallurgical, sanitary, electrical and mechanical engineers, a physical chemist and seven chemists, trained laboratory assistants, secretaries and general service men.

Laboratory research preliminary economic analyses; semi-commercial or pilot plant demonstration; plant design; equipment; and engineering supervision of erection and operation. By these services the Dorr Company will be able to maintain an unbroken contact in the evolution of a new project through all steps to its conclusion as a commercial plant in full operation.

Rules on Paper Board Hardship Cases

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., Dec. 29, 1943—If either of two conditions is met, a manufacturer of certain paper board products who because of substantial hardship is unable to supply commodities and services at established maximum prices may apply for an adjustment in his ceilings, the Office of Price Administration announced today.

This provision is made for manufacturers covered by Revised Maximum Price Regulation No. 187 (Certain Paper Board Products), whose products include such items as paper board containers, cartons, boxes and other paperboard receptacles.

The two conditions stipulated are:

1. The manufacturer's supply is necessary to meet military or essential civilian needs.

2. Loss of the manufacturer's production and service will force his customer to resort to higher priced sources of supply because no adequate substitute for the commodity or service is available to the customer at a price equal to or lower than the adjusted maximum price requested.

Only in exceptional cases where the manufacturer suffers substantial hardship and the public interest is involved in obtaining vital supplies or in keeping low priced suppliers in operation will adjustments be considered necessary, OPA said.

H. K. Porter Gets Additional Star

A star for "meritorious services on the production front" has been added to the Army-Navy E Flag of H. K. Porter Company, Inc., Undersecretary of War Robert P. Patterson has informed the company. In conferring the star, which signified renewal of the Army-Navy E, Undersecretary Patterson wrote to the men and women of Porter:

"You have continued to maintain the high standard that you set for yourselves and which won you distinction. You may well be proud of your achievement. The White Star is the symbol of appreciation from our Armed Forces for your continued and determined effort and patriotism."

Fire Destroys Austin Paper Mill

The pulp and paper mill at Austin, Pa., operated for a long period by the Bayless Pulp & Paper Corporation until it went into bankruptcy several years ago, was completely destroyed by fire last week. The mill, which had been idle for a long time, was equipped when it was in operation with six 1000-pound and three 1500-pound beaters, four Jordans, eleven washers, one 65-inch, one 114-inch and one 135-inch Fourdriniers. The sulphite pulp mill was equipped with three digesters, six chippers and four wet machines.

Andre Paper Box Co. Gets Plant

SAN FRANCISCO, Cal., December 24, 1943—The Andre Company has announced that it has acquired a new five-story plant at 545 Mission street to accommodate the company's expanding requirements. The organization, under the leadership of Noble Andre, began in 1936 in a small, one-story building on Natoma street.

We're in it for the duration

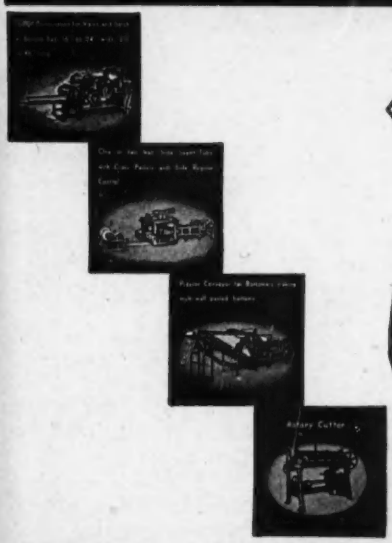
SINCE 1828

We have served the industry well, with the finest in Paper Mill Machinery.

NOW

our entire manufacturing facilities are engaged in turning out material for the mightiest and most formidable fighting machine our country has ever known.

While we cannot give you typical peacetime SW Service, we can supply you with replacements — under proper priority rating, of course.



THE SMITH & WINCHESTER MANUFACTURING COMPANY

PLANT AND OFFICES AT SOUTH WINDHAM, CONNECTICUT

FINANCIAL NEWS

New York Stock Exchange

High, Low and Last for Week Ending December 25, 1943

STOCKS

	High	Low	Last
A. P. W.	2⅛	2⅛	2⅛
Armstrong Cork Co.	37⅞	37¾	37¾
Celotex Corp.	11½	11	11¼
Celotex Corp., pf.	17	16¾	17
Certain-Teed Products Corp.	5	4⅞	5
Certain-Teed Products Corp., pf.	61	60	60
Champion Paper & Fibre Co.	21¾	19¾	21½
Champion Paper & Fibre Co., pf.	107¾	107⅝	107⅝
Congoleum Nairn Co.	22¾	22	22
Container Corp. of America	20¼	20	20
Continental-Diamond Fibre Co.	11¼	10¾	10¾
Crown-Zellerbach Co.	16	15½	15⅝
Crown-Zellerbach Co., pf.	98	98	98
Dixie Cup Co.	15¼	14¾	15¼
Dixie Cup Co.—A	43¾	42	42
Flintkote Co.	19⅞	19¼	19⅜
Flintkote Co., pf.	107⅞	107½	107½
Robert Gair	3	2⅝	2⅝
Robert Gair, pf.	12½	12½	12½
International Paper Co.	14¾	14	14¾
International Paper Co., pf.	69¾	68¼	68¾
Johns-Manville Corp.	87¾	86½	86⅞
Johns-Manville Corp., pf.	126	126	126
Kimberly-Clark Corp.	32	31½	32
MacAndrews & Forbes	26	25⅞	26
MacAndrews & Forbes, pf.	....	....	....
Masonite Corp.	38	37¼	37½
Mead Corp.	8⅜	8	8⅛
Mead Corp., pf. A—6%	80	77	80
Mead Corp., pf. B—5½%	71	68½	68½
National Container Corp.	12⅜	12¼	12¼
Paraffine Companies, Inc.	44	43	43
Paraffine Companies, Inc., pf.	....	....	....
Rayonier, Inc.	13¼	12⅞	13
Rayonier, Inc., pf.	29⅝	28⅝	29⅝
Ruberoid Co.	25	24½	25
Scott Paper Co.	37⅞	37⅞	37⅞
Scott Paper Co., pf.	111	111	111
Sutherland Paper Co.	30½	30	30¼
Union Bag & Paper Corp.	10¼	9⅝	9⅞
United Paperboard Co.	4½	4½	4½
U. S. Gypsum Co.	72	71½	71¾
U. S. Gypsum Co., pf.	168½	168½	168½
West Virginia Pulp & Paper Co.	16½	15½	16
West Virginia Pulp & Paper Co., pf.	105½	105½	105½

BONDS

Abitibi Pulp & Paper Co., 5s '53	68½	68½	68½
Celotex Corp. 3¾s '55	....	....	....
Certain-Teed Products Corp. 5½s '48	101½	100½	101½
Champion Paper & Fibre Co. 4¾s '50	....	....	....
International Paper Co. 6s '55	107	106½	106½
International Paper Co. 5s '47	104¼	104¼	104¼
Mead Corp. 3½s '53	....	....	....
West Virginia Pulp & Paper Co. 3s '54	....	....	....

New York Curb Exchange

High, Low and Last for Week Ending December 25, 1943

STOCKS

	High	Low	Last
American Box Board Co.	....	....	....
Brown Co., pf.	....	....	....
Great Northern Paper Co.	30	29½	29¾
Hummel-Ross Fibre Corp.	4	3½	4
St. Regis Paper Co.	4	3⅞	4
St. Regis Paper Co., pf.	147¾	145	145½
Taggart Corp.	5	5	5

BONDS

American Writing Paper Co. 6s '61	99½	99½	99½

Directors Meet at Institute

Technical directors of various pulp mills attended a meeting at the Institute of Paper Chemistry, Appleton, Wis., December 14, of the Sulphite Pulp Manufacturers' Committee on Waste Disposal. The committee is in its fourth year of research to evaluate all processes which would be of value in reducing stream pollution by sulphite waste liquor. The accomplishments made thus far were reviewed, including the operating results of a large scale pilot plant erected recently at the Interlake Pulp and Paper division of the Consolidated Water Power and Paper Company at Appleton. A great variety of methods has been proposed but only a few have shown promise of practical application.

New OPA Unit Chief

Ira S. Reynolds has been appointed by the Office of Price Administration as unit chief in charge of prices affecting the manufacture of newsprint, ground wood specialties, glassine and greaseproof papers. Mr. Reynolds has been connected with the St. Regis Paper

IRA S. REYNOLDS

Company for the past nine years and brings a world of experience to his new important responsibility. Previous to his going with St. Regis, Mr. Reynolds acted as branch sales manager for Nekoosa-Edwards Paper Company for a span of twenty years and as sales manager for the Claremont & Groveton Paper Company for over five years.

Herkimer Plants Sold

[FROM OUR REGULAR CORRESPONDENT]

HERKIMER, N. Y., December 27, 1943—The Herkimer Fiber Company, division of the International Paper Company, and the connected Holed Tite Division here, have both been sold to the Morley Company of Portsmouth, N. H., it was announced last week by the new owners. Eugene B. Whittemore, president of the Morley Company, said that his company has taken over both divisions but did not disclose the purchase price.

Ralph A. Farnham, superintendent of the local plants, who has been with the International Paper Company for 17 years, will remain in charge here, Mr. Whittemore said.

Mr. Whittemore disclosed that plans have not yet been discussed for reopening the Fiber Company plant which has been shut down for some time. This division will employ about 150 men when back in full operation, he said. About 30 men are employed by the Holed Tite Division at present.

The Fibre Company, for years, before it was shut down early this year, manufactured leather board and counter board for shoe heels, fibre board and other such products.

The Holed Tite Division makes many types of moulded pulp products such as packings for radio tubes, eggs, bottles, optical lenses.

Material Costs Ruling Continues

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., December 29, 1943—Manufacturers of certain paper board products must continue until March 1, 1944, to compute their raw material costs at levels no higher than the ceilings in effect for those raw materials on March 31, 1943, the Office of Price Administration announced today.

This provision was originally put into effect April 1, 1943, for a two-month period and was later extended, the last extension being to January 1, 1944. The further extension is granted so that complete information may be obtained from industry upon which a fair determination can be made by OPA as to whether or not the pricing provision should be made permanent.

Raw material cost is one of the factors used by these manufacturers to determine their ceilings under the pricing formula provided by OPA. The provision, now in effect until March 1 next, prevents any increases in raw material costs later than March 31, 1943, from being passed on to consumers by the manufacturers. Their products include folding cartons, corrugated fibre boxes, corrugated fibre sheets, solid fibre boxes, set-up boxes, partitions, pads and other items.

J. P. Lewis Co. Gives Checks

Again this year the J. P. Lewis Company, manufacturer of wood fiber boards, card boards and papers whose plant is at Beaver Falls, N. Y., gave Christmas checks to all its employees including a $50 check to each of its former employees now in the armed services.

R. H. Dempsey Heads Rising Paper Co.

Richard H. Dempsey was elected president and general manager of the Rising Paper Co. of Housatonic, Mass. at the annual stockholders and directors meetings which took place at the company's office December 17. At the same time, Horace A. Moses of Springfield, Mass., who has held those offices was named chairman of the board and remains as the chief executive of the corporation.

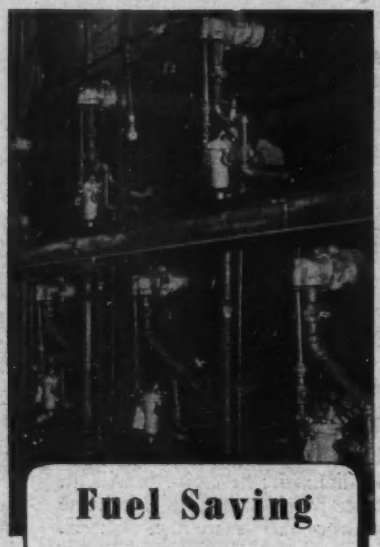
Mr. Dempsey previously had been vice-president in charge of production, having held that position since 1936. A native of Huntington, Mr. Dempsey was employed by the Strathmore Paper Company at Woronoco and West Springfield for 12 years, having started with that concern as an office boy. In 1930, Mr. Dempsey was transferred to the Rising Paper Company as superintendent and later became a director of the company.

Officers re-elected by the Rising Company were: treasurer, George E. Williamson; first vice-president, F. E. May; second vice-president, Miss Madeline Moses; assistant treasurer and secretary, W. E. Daverin; and production manager, S. C. Collins.

Leominster Board Co. Formed

[FROM OUR REGULAR CORRESPONDENT]

BOSTON, Mass., December 27, 1943—With a capital of 200 shares of stock of no par value, the Leominster Board and Specialty Company, 43 Granite street, Leominster, Mass., has been incorporated to manufacture and deal in paper board products and kindred paper goods. John J. Maxim is president and Lloyd H. Maxim, 1244 Washington street, Leominster, treasurer and representative.



Fuel Saving Opportunities in paper mills

through

COMPLETE *trapping*

MANY MILLS are finding that their condensate drainage systems are "gold mines" when it comes to realizing fuel savings. Leaky, obsolete, ill-sized and wrong type traps may cost in a season many times as much as modernization with Armstrong traps.

Armstrong trapping is complete because it performs *all* the functions necessary to efficient drainage. Both air and condensate are automatically removed, without steam loss and without fouling from dirt or scale. Maintenance is negligible, an important item in these days of manpower shortage.

Armstrong drainage equipment for paper mill service includes standard inverted bucket traps, special traps for paper machine dryer service, compound traps for digesters, evaporators, etc., and forged steel traps for high pressure power service. Write for literature or ask your Armstrong representative.

ARMSTRONG MACHINE WORKS

818 Hoffman St., Three Rivers, Mich.

Further Paper Limitations

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., December 27, 1943 — The quantity of paper consumed in newspapers, magazines, books and commercial printing will be reduced by further limitations reflecting the decline in pulpwood supplies and inventories, Donald M. Nelson, chairman of the War Production Board, announced today.

The additional restrictions implement a recent program determination for paper production and pulp allocation by the War Production Board Requirements Committee, which has been designed for the purpose of assuring adequate supplies of the various types of paper required for war and essential civilian purposes. The limitations, in every instance, are in accord with recommendations submitted to the War Production Board by industry advisory committees representing the several printing and publishing industries. They are contained in amendments to orders L-240, 241, 244 and 245 which are about to be issued, effective January 1, 1944.

It is estimated that, on an annual basis, these orders will save over a million and a quarter tons of paper. Mr. Nelson stated that these regulations will arrest the sharply declining inventories in these industries and bring consumption substantially into balance with the pulp supplies which will be made available to these industries under the new allocation program.

Large publishers and printers will have their consumption reduced approximately 25 per cent from their base period usage, with a sliding scale of proportionately lighter cuts for the smaller business units.

Producers, converters and users of non-printing papers will also receive diminished supplies of pulp and paper from current levels, under the Requirements Committee Determination referred to above. Together with these additional curtailed allocations, to be announced later, the printing and publishing orders will make it possible, without risking interruptions in operations because of inadequate inventories, to satisfy the pulp requirements for such items as container board, special industrial papers, explosives, high tenacity rayon, building papers which are being substantially increased largely for war purposes and uses.

In addition to this full scale attempt to adjust the supply and requirements situation in the pulp and paper and related industries, the Forest Products Bureau, headed by Harold Boeschenstein, is carrying forward a drive to increase the rate of pulpwood production, the collection and use of waste paper and the introduction of manufacturing processes to stretch the available pulp supply to its maximum utility for paper uses.

Seventy-two per cent of the nation's supply of newsprint is manufactured in Canada and five per cent comes from New Foundland, while the types of paper used by book and magazine publishers, and by commercial printers, depend in part on imports of pulp and pulpwood from Canada, Mr. Boeschenstein pointed out. Canadian mills are being urged to increase their production of newsprint, pulp and pulpwood to the greatest extent possible without sacrificing other essential war programs, and to maintain the proportions of pulpwood and wood pulp shipments with newsprint to the United States, which are necessary to the operation of paper mills manufacturing essential items, particularly in the New England and Lake States areas.

"Every effort has been and will be made," Mr. Boeschenstein declared, "to maintain the relative position of all branches of the graphic arts industries and to impose necessary restrictions on an equitable basis, consistent with the unique problems faced by each segment."

As in the past, newspaper publishers' quarterly consumption quotas will be calculated upon a base representing the tonnage used in printing their net paid circulation in the corresponding quarter of 1941, plus a 3 per cent allowance for production waste. In the amended newspaper order the base will be adjusted for each newspaper to compensate for circulation increase in 1942 over 1941. This amendment will remove the necessity for a majority of the appeals under Limitation Order L-240, which have created a difficult administrative problem under the 1943 order. Newspaper publishers who use less than 25 tons of print paper per quarter will continue to be exempt from reduction. Other publishers will be subject to a reduction of 4 per cent of their base tonnage over 25 tons but not over 125 tons, 8 per cent of the amount over 125 tons but not over 250 tons, 12 per cent of the amount over 250 tons but not over 500 tons, 20 per cent of the amount over 500 tons but not over

1,000 tons, and 24 per cent of the amount over 1,000 tons.

"Publishers of large metropolitan newspapers will be obliged to reduce their consumption of paper below the 1941 level by an amount substantially in excess of 24 per cent, because of the spread between net paid circulation and gross press run," H. M. Bitner, Director of the Printing and Publishing Division stated. Small newspapers cannot effect the full reduction imposed upon the large newspapers because a minimum number of pages is necessary in order to maintain adequate newspaper service to the communities which these newspapers serve, he added.

Estimated consumption of print paper by all U. S. newspapers, except country weeklies, in the first quarter of 1941 was 869,296 tons. Under the new order savings of 205,709 tons are anticipated in the first quarter thus reducing consumption by 23.6 per cent. Should this rate of usage be contained throughout the year, a greater rate of reduction would be effected for the second and fourth quarters.

It is estimated that approximately 941,000 tons of paper were consumed in printing magazines during 1942, the base period of the magazine order. No reduction will be imposed on publishers whose average quarterly use in 1942 was 5 tons or less. Publishers whose quarterly base usage was more than 5 tons but not more than 27.8 tons will be restricted to 90 per cent of their quarterly base or 5 tons, whichever is larger.

It is estimated that these reductions will bring the 1944 consumption of paper by magazine publishers to approximately 711,500 tons. This represents an annual saving of 229,500 tons or 24.4 per cent.

During 1943, when magazine publishers operated under a 10 per cent limitation, they were able to maintain approximately the same number of pages and copies of their publications by using lighter weight paper, narrower margins, smaller type and other conservation measures. However, it is believed that a large part of economies which are practicable have now been instituted and that magazines in 1944 will be smaller in size with perhaps some curtailment of circulation.

In 1942, the base period under Order L-245, book publishers used an estimated 142,036 tons of paper. No reduction will be imposed upon publishers whose 1942 usage was less than 20 tons. Publishers who used between 20 and 100 tons in 1942 will be obliged to take a cut of 15 per cent on the amount over 20 tons. Publishers whose 1942 usage was more than 100 tons must take a cut of 25 per cent. It is estimated that in 1944, 108,280 tons of paper will be used in the printing of books. This is an annual saving of 33,756 tons, or 23.1 per cent, less than in 1942. In addition, the Army Service Forces have requested an allotment of 15,000 tons for books to be furnished by publishers at cost to the Army Library Service and the U. S. Armed Forces Institute.

Estimated consumption of paper by commercial printers for non-governmental purposes in 1941, the base period under Order L-241, was 1,221,000 tons. Printers whose quarterly usage of paper in 1941 for commercial accounts was less than 10 tons are not required to reduce their 1944 consumption below the 1941 level. Printers, who used more than 10 tons but less than 13⅓ tons in any quarter in 1941, have a quota of 10 tons for the corresponding quarter of 1944. All other printers are cut 25 per cent. These reductions will result in an estimated yearly saving of 220,250 tons or 18.03 per cent.

Fighters on the WARREN PUMP Production Front. No. 8 of a Series

"JAKE" Noppa, a veteran of 26 years experience with Warren, is a freedom-loving man . . . and he fights for it in a way that does the dictators the most harm — helping to make the Warren Pumps needed on the war and war production fronts. How effectively "Jake" and his fellow Warren workers are doing their jobs is symbolized by the "E" for excellence pins that the Army and Navy of the United States has awarded to them! And every man and woman on the Warren Production Front can be depended upon to produce the efficient, reliable Warren Pumps that are needed in increasingly larger quantities . . . depended upon for an honest endeavor to break every production record asked of them for the pumps that are "built to fit the job."

WARREN PUMPS

WARREN STEAM PUMP COMPANY, INC.
WARREN, MASSACHUSETTS

PAPER
TRADE JOURNAL
This Reg. U. S. Pat. Off.
Henry J. Berger
EDITOR

Vol. 117 December 30, 1943 No. 27

COMING EVENTS IN PAPER INDUSTRY

American Paper and Pulp Association, Sixty-seventh Annual Convention and meeting, Waldorf-Astoria Hotel, New York, February 14-18.
Technical Association of the Pulp and Paper Industry, Convention, Commodore Hotel, New York, February 14-17.
National Paper Trade Association of the United States, Convention, Waldorf-Astoria Hotel, New York, February 14-17.
The New York Association Of Dealers In Paper Mills' Supplies, Annual Banquet, Commodore Hotel, New York, Tuesday, February 15.
New England Section. Technical Association of the Pulp and Paper Industry—Third Friday of each month at the Roger Smith Hotel, Holyoke, Mass.
Delaware Valley Section. Technical Association of the Pulp and Paper Industry—First Friday of each month at the Engineers Club, Philadelphia, Pa.
Lake States Section. Technical Association of the Pulp and Paper Industry—Second Tuesday of each month at the Conway Hotel, Appleton, Wis.
Kalamazoo Valley Section. Technical Association of the Pulp and Paper Industry—First Thursday of each month at the Park, American Hotel, Kalamazoo, Mich.

DISTRIBUTION

Distribution is one of the great unsolved problems in the economies of all nations. Successful as Americans have been in steadily increasing production through new methods and constantly improved equipment, only relative moderate success has been achieved in distribution. The development of the largest practicable market for products of large-scale production has long been the objective of our leading industrialists. Leading men and organizations in agriculture have also long studied the problem. Some progress has, of course been made in effecting wider distribution of various products but as output has increased the difficulties of effective distribution have increased. Direct sales to the ultimate consumer have been repeatedly tried, sometimes with individual success, but on the whole not nearly enough has been accomplished. Cooperative marketing plans of varying types have been tried out and continue in effect in the distribution of some goods but largely in agricultural products. It is still comparatively simple to attain the economical production of most goods but the problem of distribution continues to remain a complex and expensive system of delivering goods from the producer to the consumer.

In its release on December 15 to the press, the National Association of Manufacturers calls "The Salesman the forgotten man who will lead to post-war jobs." Production needs distribution, the comment goes on to say. "Most of the past and current discussion of post-war conversion problems has been focused on the problem of production. Relatively little consideration has been applied to the problems of distribution. Mass production methods have come to be accepted as a peculiarly American achievement. But it is frequently overlooked that mass production methods could not have been realized without the development of mass distribution. Since production during the war has demonstrated its capacity to produce goods far in excess of any pre-war output, it seems self-evident that in the post-war years distribution will be confronted with the challenge of getting production to consumers on a larger scale than ever before, if post-war production and consumption are to approximate levels needed for higher living and substantially full employment. Under these conditions of all-out war, these salesmen have been the 'forgotten men'. The one big customer, the government, has done the buying on a scale which far exceeds all previous concepts of industrial production and total employment. If anything approaching the same volume of manufacture is to be sustained in the post-war years, millions of individual buyers must take the place of the one big buyer. When the production of consumer goods is resumed and adequate stocks again become available, the volume of trade will again depend upon persuasiveness of salesmanship and convenience of purchase."

In discussing how to effect better distribution the comment states in part that, "Much attention has been directed at buying power, but wanting power as stimulated by salesmanship and advertising, has nourished the tree of prosperity and produced its fruit. The urge to improve one's standard of living is the strongest stimulus to industry and thrift. The forced draft of war production has stimulated further progress in manufacture technology and in refined craftsmanship. To furnish ample outlets for finer products at lower costs will, in the normal trend of human progress, require super-charging of the industrial motive power by further stimulation of wants in order to reach higher altitudes in the scale of living."

Declaring that much depends upon distribution research, the article states in part: "Distribution executives, should and will rely more heavily than ever before on the techniques of distribution research. Basically, distribution research properly used, provides the means by which management can determine the wishes of its potential customers: what they will buy and what they will not buy; at what price level they will buy a specific commodity freely and what price level will buy in limited quantities or not at all; whether markets are capable of expansion; what product improvements will increase utility or pleasure; and how costs of distribution can be progressively lowered in the interests of reduced prices to consumers. Distribution research, when it is effectively teamed with product research, may be industry's most effective, as it certainly is industry's most modern machinery for measuring market possibilities and distribution efficiency. . . . Distribution research

should be more generally applied in industrial marketing, as it has been in the field of consumer goods. . . . The industrial market includes not only capital goods going to all industrial and commercial concerns and utilities; it includes also the raw materials and semi-manufactured goods purchased by industry for fabrication."

In commenting on numerous federal, state and local laws which act as trade barriers, the article concludes: "Every such law, unless genuinely justified on the ground of public welfare, is a blow at free enterprise. One such law begets another, and in the end all business suffers from the paralyzing effect which such legislation has on distribution activities."

D. of C. Paper Mills to Sell Land

WASHINGTON, D. C., December 29, 1943—The District of Columbia Paper Mills, Inc., has received authority through a District Court judgment, to sell a piece of land, south of Water street, N. W., and a short distance west of Wisconsin avenue to the Real Estate & Improvement Company of Baltimore, for the sum of $55,000.

The property, described by G. B. Craighill, attorney for the paper mills, as containing some 25,000 square feet, is a part of property put up in 1936 as security for bonds issued by the paper mills corporation. The money derived from the sale will go toward the payment of interest due in 1939, 1940 and 1941 to bondholders.

The piece of property to be sold already is under lease to the Real Estate and Improvement Company a subsidiary to the Baltimore & Ohio Railroad which has tracks on the property, it was explained.

Production Ratio Report*

(Production as per cent of six-day capacity)

COMPARATIVE WEEKLY SUMMARIES

Current Weeks—1943		Corresponding Weeks—1942	
November 13	89.4	November 14	89.7
November 20	91.0	November 21	86.9
November 27	89.8	November 28	82.3
December 4	91.7	December 5	84.9
December 11	89.6	December 12	88.4
December 18	89.1	December 19	87.9

COMPARATIVE MONTHLY SUMMARIES

Year	Jan.	Feb.	Mar.	Apr.	May	June	July
1942	104.5	103.9	102.9	100.4	95.3	87.4	75.8
1943	87.2	88.9	89.5	88.7	91.4	86.4	84.4

Year	Aug.	Sept.	Oct.	Nov.	Dec.	Year Avg.
1942	80.8	82.8	90.6	86.9	80.1	90.4
1943	91.1	88.3	90.2	90.6		

COMPARATIVE YEARLY SUMMARIES

	1936	1937	1938	1939	1940	1941	1942	1943
Year to Date..	80.5	81.1	71.7	83.4	86.0	97.6	91.3	88.8
Year Average..	80.4	79.8	71.5	83.4	85.6	97.4	90.4	

* Based on tonnage reported to American Paper and Pulp Association. Does not include mills reporting to National Paperboard Association, except in isolated cases where both paper and paperboard are produced and separate tonnage figures are not readily available. Does not include mills producing newsprint exclusively.

PAPERBOARD OPERATING RATIOS†

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year Avg.
1937	83	89	89	91	88	80	69	77	72	70	57	47	75
1938	56	63	63	60	60	59	59	60	70	73	67	61	64
1939	65	73	76	74	69	73	68	77	82	91	88	77	77
1940	78	75	74	76	82	85	77	79	78	85	82	77	78
1941	81	88	89	89	91	94	92	98	95	99	98	90	92
1942	102	101	101	95	82	72	68	75	76	81	82	77	84
1943	86	88	94	94	96	94	89	96	94	94	93		

Week ending Nov. 13, 1943—95
Week ending Nov. 20, 1943—94
Week ending Nov. 27, 1943—91
Week ending Dec. 4, 1943—95
Week ending Dec. 11, 1943—96
Week ending Dec. 18, 1943—96

† Per cents of operation based on "Inch-Hours" reported to the National Paperboard Assn.

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Section of the
TECHNICAL ASSOCIATION
OF THE PULP & PAPER INDUSTRY
122 E. 42nd St., New York 17, N. Y.
Edited by R. G. Macdonald, Secretary

Process Water Used in the Manufacture of Fine Paper*

By Lewis B. Miller[1]

Abstract

A summary is given of the results of a questionnaire on the quality of water used in the manufacture of fine papers. The range of color, turbidity, solids, iron, manganese, hardness, alkalinity, pH, sulphates and chlorides, organic matter, and silica contents is included with such limitations as have been imposed by the various mills.

This report is based on part of the information submitted by manufacturers of high grade papers in the Water Committee of the Technical Association of the Pulp and Paper Industry's program on the use of water as a raw material. The immediate objective in the collection of these data was to assemble authoritative information regarding the quality of process water used in the manufacture of high quality papers (reported herein) and the methods of water treatment which have been found necessary to produce the desired water quality from the raw water available. The ultimate objective in the collection of these data is the preparation of a TAPPI Standard on the quality of water required for the manufacture of fine papers.

In the original report are listed those several types of high grade paper which are made by the manufacturers who participated in this project.

Water Quality

The sources of raw water include rivers, lakes, and wells. Of the 42 mills replying to the original questionnaire, twenty indicate that their raw water supply is contaminated by sewage or industrial wastes but of these, five mills state that the contamination is only slight. The nature of the contaminating substances in the raw waters, as listed by the mills, shows wide variations. These include sewage and various industrial wastes, iron, silt, bark and wood waste, plant growths and their decomposition products, mine drainage, algae, etc.

Forty-one of the 42 mills replying indicate that they employ some type of treatment of the raw water to adapt it for use as process water: two mills report only mechanical treatment, thirteen report chemical treatment only, the remaining 25 use a combination of mechanical and chemical treatment. The two mills using mechanical treatment use screens in one case and pressure filters in the second. Of the 39 using chemical treatment, twenty employ chemical coagulation, 22 employ chlorination, one uses aeration, three employ copper sulfate, and one makes use of activated carbon.

Turbidity and Color

Data upon the raw waters indicate that the waters vary from 0 to 500 p.p.m. in turbidity and from 0 to 300 units of color. Most mills manufacturing fine papers apparently determine both color and turbidity as a routine procedure since only a few mills failed to report information on these constituents or reported only in qualitative terms.

On permissible upper limits of turbidity, the requirements varied between 0 and 25 p.p.m.; the average being under 10 p.p.m. for satisfactory process water. In this connection, however, it is interesting to note that 21 mills submitted an upper limit for color and turbidity, while twenty mills have no standards. On permissible upper limits for color, the replies to the questionnaire show even greater diversions of opinion. Color as low as 0 is specified and in one case an upper limit of 170 color units is indicated. In general it appears that turbidity is considered a more important factor in the production of high grade paper than is color.

Total Solids

Data upon the total solids present in raw and processed waters have also been obtained. Raw waters vary between 8 and 465 p.p.m. in total solids; process waters vary between 1 and 460 p.p.m. The data on the water said to contain only 1 p.p.m. of total solids appears slightly doubtful, since the water is stated to be alum treated and therefore should normally contain a higher content of total solids. Only two mills set upper limits on total solids content, the values indicated being 120 and 150 p.p.m. Total solids in this case refer to the total dissolved solids obtained by analyzing the waters after filtration through filter paper in the laboratory.

The importance of total dissolved solids in process water is difficult to evaluate without knowing the nature of the dissolved substances. Obviously such dissolved substances as hardnesses, manganese, or

* A summary of a portion of the Special Report No. 333 published by the Technical Association of the Pulp and Paper Industry, 122 East 42nd St., New York City, September 27, 1943.

[1] Member of TAPPI; Chairman of the TAPPI Water Committee[2].

[2] The TAPPI Water Committee consists of the following members: Lewis B. Miller, Chairman; C. M. Connor; R. B. Martin; Miss L. E. McGrath; W. F. Mitchell; J. G. Patrick; E. N. Poor.

iron are much more undesirable than certain other types of dissolved salts. Total dissolved solids may therefore be of comparatively little importance or of very great importance. Three mills specify upper limits for total dissolved solids at 75, 150, and 100 p.p.m.

Iron

It is generally recognized that iron is one of the more undesirable constitutents in process water used for the manufacture of fine paper. The raw waters reported varied between 0.01 and 48 p.p.m. of iron. Process waters are reported as varying between 0.06 and 58 p.p.m. of iron with seven manufacturers indicating a content in excess of 0.3 p.p.m. The quantities are, 58.0, 7.0, 0.4, 0.9, 8.0, 1.2, and 1.0 p.p.m. Only five of the 42 plants placed upper limits, 0.3, 10.0, 0.25, 3.0, and 0.2 p.p.m., expressed as Fe, upon the iron content of process water. In this connection it is important to remember that iron is one of the worst offending substances in causing color, stains, spots, etc. in papers during their manufacture. Iron in concentrations above 0.3 p.p.m., expressed as Fe, in drinking waters will cause iron stains on white porcelain sinks and in bathroom fixtures, therefore the Public Health Service drinking water standards limit the iron content of palatable water to 0.3 p.p.m. Because process waters containing 0.3 p.p.m. of iron in soluble form or in precipitated form as iron hydroxide would undoubtedly impart color and stains to light colored, high quality papers, it is astonishing that so few paper manufacturers have specifications setting an upper limit upon the iron content of their process water and even more so that two manufacturers of high grade papers should have placed an upper limit at 3.0 and 10.0 p.p.m. It would not logically appear possible that a fine paper could be manufactured with some of these process waters. However there is always a possibility that an error was made in the reply to the questionnaire but if the analyses of these waters are correct, there is no question that the manufacturers in several cases are placing themselves under a great handicap.

Manganese

Those comments which apply to iron may also be applied to the manganese content of the process waters since manganese has a more detrimental effect than iron on the quality of fine papers. In the replies to the questionnaires only one manufacturer placed an upper limit of 0.2 p.p.m. on manganese. The raw waters are reported as containing from a trace up to 8.20 p.p.m. of manganese, expressed as Mn, and the process waters are reported as containing from a trace up to 7.0 p.p.m. Failure to set an upper limit upon manganese in most cases may be because of the fact that the raw waters in question did not contain manganese and the manufacturers, therefore, were not required to consider this element. As indicated in the case of iron, several of the manufacturers of fine papers greatly handicap their efforts to manufacture a high quality product because of the manganese content of their process waters, if such waters actually contained the quantities reported.

Hardness

Total hardness of raw waters varies from 18 to 405 p.p.m. and of process waters from 35 to 405 p.p.m None of the manufacturers have placed an upper limit upon total hardness. This is interesting since it is fairly well recognized that hardness has an adverse effect upon paper manufacturing in several ways but particularly in its effect upon sizing.

The permanent hardness of raw waters is reported as varying from 16 to 227 p.p.m.; of process waters between 20 and 130 p.p.m. with two manufacturers placing upper limits at 40 and 100 p.p.m.

The temporary hardness of raw waters is stated to vary between 14 and 309 p.p.m. Process waters range between 5 and 350 p.p.m. Five manufacturers placed upper limits of 100, 75, 100, 50 and 100 p.p.m. respectively, on temporary hardness.

Total hardness is of importance in paper manufacture since the calcium and magnesium ions, which constitute the active constituents of hardness, combine chemically with many sizing materials to produce products of little or no value as sizing, thus causing an economic loss of the sizing materials. Temporary hardness not only causes a loss of sizing materials, but because of its tendency to form calcium carbonate scales (particularly, when the water is heated) it also interferes with machine operation by plugging the screens, pipes, etc. It is also undesirable because of its tendency to release carbon dioxide gas when the water is either heated or when the pH of the water is lowered as by the addition of alum, during the sizing operation. The magnesium ion present in the form of both permanent and temporary hardness may also form insoluble scales, especially with silica, the scale usually having a composition represented by a hydrated magnesium silicate.

While hardness may be costly to paper manufacturers because of its tendency to react with the sizing materials and may interefere with machine operations because of its scale forming tendency and its capacity for releasing carbon dioxide gas under appropriate conditions, its effect upon paper quality is much less adverse than that of iron or manganese. Fortunately color, turbidity, iron, manganese, and hardness are all water constituents which may be readily and economically removed by appropriate treatment of the water supply.

Alkalinity

Data was also obtained upon the alkalinity of raw and process waters. Alkalinity to methyl orange in raw waters falls between 3 and 350 p.p.m. and in process waters between 4 and 350 p.p.m. Although four manufacturers placed upper limits of 150, 70, 50 and 7 p.p.m. on methyl orange alkalinity, only four analytical results are reported on phenolphthalein alkalinity with no limitation stated by any manufacturer. Since alkalinity, except in the special case of alkali waters, is normally closely associated with temporary hardness, the same comments are generally applicable.

Hydrogen Ion Concentration

The pH of raw waters is reported between 4.8 and 8.1. Process waters are said to vary between a pH of 5.2 and 9.3. Seven manufacturers placed permissible limits of pH upon process waters between 5.5 and 8.2. In the preparation of the questionnaire the Water Committee erred in not requesting both upper and lower limits for pH. Presumably the lower pH values submitted as limiting values are for lower limits while the higher pH values are upper limits. Hydrogen ion concentration has such an important part in paper manufacture because of its effect upon so many different factors, that each manufacturing operation must be considered individually before at-

tempting to determine the proper pH limits for that operation. One factor may cause one manufacturer to use one set of limits of pH, while another factor will determine the selection of a different range in the case of another manufacturer.

Sulphates and Chlorides

Sulfates and chlorides are of minor significance in paper manufacture consequently the data submitted regarding the sulfate and chloride content of raw and process waters are only of general interest. These elements would probably have an adverse affect on paper manufacture if present in comparatively high concentrations. Permissible upper limits are of interest and value in reflecting the attitude of various manufacturers on this subject.

Organic Matter

Organic matter is reported to be between 0 and 133 p.p.m. on process waters and two manufacturers have placed an upper limit of 0 and of 20 p.p.m. Since the nature and type of organic matter may vary greatly, the upper limit permissible would necessarily be determined by each specific condition, but it is usually desirable to maintain the organic content of the process water at as low a level as possible.

Silica

The silica content of raw water varies between 0.42 and 35 p.p.m.; process water contains between 0.6 and 32 p.p.m. Two manufacturers set upper limits of 22 and 30 p.p.m. on this water constituent. Although silica is one of the lesser important constituents from the standpoint of paper manufacture, it should not exceed moderate concentrations. Silica content in this case refers to soluble silica.

Information was also obtained regarding those constituents which are found to be most objectionable by the different manufactures and the methods of treatment to remove or reduce the concentration of these constituents. The data obtained do not lend themselves to generalization. They are of interest and importance in that they reflect a great variety of problems which confront the paper manufacturer and indicate some of the methods utilized to solve these problems.

Acknowledgment

The Water Committee wishes to express its appreciation to the manufacturers that submitted data, to Mr. R. G. Macdonald, secretary of TAPPI and his staff, and particularly to Mr. V. F. Waters for the assistance given the committee on this project.

TAPPI Notes

The Ohio Section of the Technical Association of the Pulp and Paper Industry have recently elected the following officers for 1943-44: Chairman, Carl D. Roess, Wrenn Paper Company; Vice Chairman, Duncan S. Brown, Gardner-Richardson Company; Secretary-Treasurer, Douglas Robbins; Executive Committee, R. B. Roe, Sorg Paper Company, George H. Harvey, Gardner-Richardson Company, H. H. Latimer, Champion Paper and Fibre Company, K. P. Geohegan, Aetna Paper Company and John E. Burdsall, Crystal Tissue Company.

The Technical Section of the Canadian Pulp and Paper Association will meet at the Mount Royal Hotel, Montreal, P. Q., January 26-28, 1944.

The TAPPI Kalamazoo Valley Section and the Michigan Division of the Superintendents Association will meet at the Park American Hotel, Kalamazoo, Mich., at 6:30 P.M., January 13, 1944. Dean James E. McCarthy of the College of Commerce, Notre Dame University, will be the principal speaker.

The TAPPI Lake States Section will meet at the Conway Hotel, Appleton, Wis., on Tuesday evening, January 11, 1944. Lewis Klein of the Resinous Products and Chemicals Company will talk on the use of resins in paper.

Roger O. Benjamin of the West Virginia Pulp and Paper Company is now in the United States Army.

H. L. Renehan, formerly of the H. P. Smith Paper Company, is now with Valley Industries, 60 East 42nd street, New York, N. Y.

Milton J. Maguire is now resident manager of the Hercules Powder Company, Inc., Portland, Ore.

Harry G. Davis is now director of paper development and control, Ozalid Products Division, General Aniline and Film Corporation, Johnson City, N. Y.

Wiliam M. Shoemaker, formerly of the National Vulcanized Fibre Company, is now manager of the Philadelphia office of Douglas T. Sterling Company, management consultants. Mr. Shoemaker has recently been appointed chairman of the TAPPI Industrial Engineering Committee, replacing J. R. Atwater of the O. P. A.

Ernest O. Nash, formerly with the North American Pulp and Paper Company, is now color chemist and foreman for the New England Card and Paper Company, Springfield, Mass.

John E. Parnell, formerly with the Chemical Warfare Service, U. S. Army, is now supervisory engineer for Clinton Engineers, Tennssee Eastman Corporation, Oak Ridge, Tenn.

Harry J. Stilp, formerly of the Corn Products Refining Company, is now paper technician for the Trimz Company, Inc., United Wallpaper Factories Inc., 1012 Co. Spaulding Ave., Chicago, Ill.

K. G. Chesley of the Crossett Lumber Company, has been appointed Chairman of the TAPPI Alkaline Pulping Committee, replacing Paul Hodges, deceased.

Arthur Wakeman Goes Abroad

Washington, D. C., Dec. 29, 1943—Arthur G. Wakeman, Assistant Director of the War Production Board's Forest Products Bureau, and formerly Director of the Pulp and Paper Division, has left Washington on a special official mission to England for the Forest Products Bureau.

His assignment includes conferring with British and other government and industrial officials on problems involving pulp, paper and paper board products. Special atention will be given to international problems, and the coordination of the activities of the allied countries.

Mr. Wakeman expects to be abroad about six weeks. His home and business are in Appleton, Wis., where he served several years as general manager of the Fox River Corporation, manufacturers of fine writing and special papers, before joining WPB in March, 1942.

Sulphite Pulp Production—Some Factors Pertinent to Meeting War Born Shortages*

By J. N. McGovern[1] and G. H. McGregor[2]

Abstract

The prospect of a serious shortage of sulphite pulp in 1944 prompted the Forest Products Laboratory to survey ways of increasing pulp production under existing conditions. It is suggested that (1) non-critical pulping species and logging, sawmill, and veneer mill wastes be utilized to the full extent of their availability; (2)advantage be taken of dense woods giving high yields per wood volume; (3) the pulping process be conducted in conformity with known principles for maximum pulp production; and (4) fiber losses from chip preparation and pulp treating and bleaching be minimized. Briefly discussed are pulping procedures applicable to species less commonly used for sulphite pulping, including aspen, cottonwood, birch, maple, gum, beech, northern pines, tamarack, western pine, larch, Douglas-fir, southern pine, western redcedar, Sitka spruce, alder, and mixed species. Sulphite process variables affecting pulp production are examined in some detail. Finally, general observations are given on methods of reducing fiber losses in the operation of wood and chip preparation, pulp washing, screening, and bleaching.

Present trends in the sulphite pulp industry indicate a continued demand at the current high level but a decline in production, with the probability of an acute pulp scarcity in 1944. This prospective reduction in sulphite pulp production arises primarily from shortages of woods labor and logging facilities employed to produce pulpwood. Provision for sufficient woods labor is a direct and obvious way of averting the impending pulp scarcity. The threatened shortage can also, however, be lessened by utilizing species that are available but seldom used for sulphite pulping, and by operating the pulp mill so as to obtain the maximum yield of pulp from the available wood. These expedients are manifest and no doubt have come to the attention of most mill operators. Nevertheless, it is believed worth while under the present emergency conditions to focus attention on any ways in which sulphite pulp production can be improved. In this report possible pulpwood sources are pointed out, the general pulping procedures to be used with the less common species are indicated, and possible means of carrying on the sulphite pulping operation so as to obtain increased pulp yields are reviewed. The information appearing in this report can be found for the most part in the literature on sulphite pulping or in the experience of mill operation, although generally in some other connection. It is realized, too, that "best" practice, as judged by successful modern performance, will sometimes conflict with an individual mill's experience as to the best way to perform a particular operation.

Seldom-Used Species

Many sulphite mills in the United States can perhaps augment their dwindling supplies of spruce, balsam and grand fir, and eastern and western hemlock, which are generally cut at some more or less distant point, with locally available wood species considered heretofore as being more or less unsuited for sulphite pulping. Depending on the region, such supplementary wood supplies might consist of logging, sawmill, and veneer mill wastes and second-growth wood-lot material obtainable in the vicinity. This material would be for the most part made up of hardwoods, such as aspen, birch, beech, maple, tupelo (gum), and cottonwood; northern pines, such as jack, red, and white; tamarack; western species including larch, white pine, red cedar, and Douglas-fir; and some southern pine. During the last 15 or 20 years, interest has expanded in the use of these so-called "inferior" species in an endeavor to broaden the pulpwood base, and considerable literature has appeared on the subject. In practice, several mills have utilized this source of wood to considerable advantage. The present appears to be a favorable time to utilize these less common pulping species to the utmost.

Certain disadvantages may attend the use of such woods as the hardwoods, pines, and other little-used conifers. The pulps obtained from them may be relatively low in strength, shivey, of poor color, or bleachable only with difficulty. Some of the species, such as Douglas-fir, southern pine, and tamarack containing a large portion of heartwood, may have to be cooked drastically to produce an acceptable pulp. Others may be limited to uses permitting unbleached pulp. Such inferiorities, however, can be tolerated in the face of a serious pulp shortage. On the other hand, some of these species possess the advantages of relatively low cost, large yields of pulp from a unit of wood volume, and increased digester yields. Further, pulps from certain of these species may have particular properties which make them especially suitable for special purposes.

Physical and Chemical Characteristics

The densities and chemical compositions of a number of the common and some of the less commonly used pulpwoods are given in Table I, which can be used as a general guide to the properties of numerous species of potential use in sulphite pulping. It should be recognized that the values given in Table I were obtained from random samples tested at the Forest Products Laboratory. Many of the species show a wide variation in properties within the species itself, and other similar shipments could have properties considerably different from those given in Table I. In addition to the variation within a species, certain outstanding differences exist between various

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* Presented at the Army and Navy Requirements Conference of the Technical Association of the Pulp and Paper Industry, Palmer House, Chicago, Ill., Sept. 21-23, 1943.

[1] Member TAPPI; Associate Technologist, Forest Products Laboratory,* Forest Service, U. S. Department of Agriculture.

[2] Member TAPPI; Senior Engineer, Forest Products Laboratory,* Forest Service, U. S. Department of Agriculture.

* Maintained at Madison, Wis., in cooperation with the University of Wisconsin.

TABLE I.—DENSITY AND CHEMICAL COMPOSITION OF THE COMMON PULPWOODS AND SOME WOODS LESS-COMMONLY USED FOR SULPHITE PULPING[1]

Species	Density (moisture-free weight and green volume) Lb. per cu. ft.	Chemical composition of wood (moisture-free)						
		Holo-cellulose		Cross and Bevan cellulose		Lignin %	Total pentosans %	Solubility in ether %
		Total %	Alpha %	Total %	Alpha %			
HARDWOODS								
Aspen *(Populus tremuloides)*	22	82	51	64	48	17	23	1.0
Beech *(Fagus grandifolia)*	34	..	..	..	..	23	20	.3
Birch, paper *(Betula papyrifera)*	34	..	..	60	41	25	26	1.5
Birch, yellow *(B. lutea)*	34	..	..	61	..	..	25	.6
Cottonwood *(Populus deltoides)*	23	..	..	63	46	24	19	.3
Maple *(Acer saccharum)*	35	76	..	57	42	23	21	.3
Tupelo (gum) *(Nyssa aquatica)*	30	..	..	60	46	24	17	.3
SOFTWOODS								
Douglas-fir *(Pseudotsuga taxifolia)*	29	..	..	59	43	30	8	1.5
Fir, balsam *(Abies balsamea)*	21	70	44	58	42	29	11	1.0
Fir, grand *(A. grandis)*	23	..	..	63	46	27	9	.9
Hemlock, eastern *(Tsuga canadensis)*	24	68	48	56	43	32	10	.7
Hemlock, western *(T. heterophylla)*	25	..	..	59	43	30	9	.5
Larch, western *(Larix occidentalis)*	28	..	..	58	..	..	11	.8
Pine, jack *(Pinus banksiana)*	24	72	49	58	41	27	13	2.0
Pine, northern white *(P. strobus)*	21	..	..	60	44	28	11	5.0
Pine, red *(P. resinosa)*	27	..	..	54	..	24	11	5.0
Pine, southern slash *(P. caribaea)*	30	..	..	59	42	29	12	4.0
Pine, western white *(P. monticola)*	23	..	..	60	42	26	10	3.0
Red cedar, western *(Thuja plicata)*	19	..	..	..	..	..	..	..
Spruce, black *(Picea mariana)*	24	..	..	61	44	27	11	1.0
Spruce, red *(P. rubra)*	24	73	48	60	43	27	12	1.5
Spruce, Sitka *(P. sitchensis)*	24	..	..	62	45	27	7	1.0
Spruce, white *(P. glauca)*	24	73	49	61	44	27	11	1.5
Tamarack *(Larix laricina)*	31	..	..	..	..	..	..	..

[1] Average values for samples tested at Forest Products Laborattory; wide variations may occur within single species.

species. In general, the hardwoods, as is well known are denser, have shorter fibers, and are lower in lignin and higher in pentosan contents than the softwoods. Density is an important property from the standpoint of pulp yield obtained from a unit volume of wood, and fiber length has an important effect on pulp properties. The softwoods themselves, which include the common pulping species, vary relatively little in percentage of the main chemical constituents in the wood, but show an appreciable variation in their contents of the minor constituents. The ether-soluble values given in Table I for the various woods illustrate this variation. Other minor constituents, whose identities have not been fully established, are believed also to affect the pulping of some species and the color of others.

Pulping Procedures

Pulping most of the less common species by the sulphite process requires no radical changes from the pulping procedures used for the customary pulpwoods, although several points of difference in pulpability and pulp characteristics can be mentioned. These differences are outlined in Table II.

Aspen and Cottonwood.—Since aspen and cottonwood, because of their relatively lower densities (particularly that of northern grown aspen) may be charged in slightly lower weights than spruce or hemlock (approximately the same as that for fir) some slight adjustment in acid concentration or temperature schedule may be made with advantage. In practice, however, the cooking procedures for woods of either higher or lower density are generally the same. Controlled chip packing, with the resultant increase in digester charge, may offset natural differences in density between these hardwoods and other softwoods. Aspen and cottonwood chips are penetrated with sulphite acid in the same time as spruce chips,

TABLE II.—SULPHITE PULP YIELDS AND PULPING CHARACTERISTICS OF THE COMMON PULPWOODS AND OF SOME LESS-COMMONLY USED SPECIES[1]

Species	Density (moisture-free weight and green volume) Pounds per cubic foot	Moisture-free wood per cord[2] Pounds	Yield of moisture-free screened pulp		Ease of pulping by usual procedures	Pulp characteristics			
			Per 100 pounds moisture-free wood Pounds	Per cord[2] Pounds		Fiber length	Color	Bleachability	Remarks
HARDWOODS									
Aspen	22	1870	49	855	No difficulty	Short	Light	No difficulty	Possible pitch
Beech	34	2890	44	1195	Slight difficulty	Short	Dark	Some difficulty	.....
Birch	34	2890	46	1250	Slight difficulty	Short	Medium	Slight difficulty	Possible pitch
Cottonwood	23	1950	49	900	No difficulty	Short	Light	No difficulty	.....
Maple	35	2970	45	1255	Slight difficulty	Short	Dark	Some difficulty	.....
Tupelo (gum)	30	2550	48	1150	No difficulty	Short	Light	No difficulty	.....
SOFTWOODS									
Douglas-fir	29	2460	48	1110	Heartwood difficult	Long	Dark	Heartwood difficult	Red-yellow color
Fir, balsam	21	1780	47	790	No difficulty	Medium	Light	No difficulty	.....
grand	23	1950	49	900	No difficulty	Medium	Light	No difficulty	.....
Hemlock, eastern	24	2040	44	840	No difficulty	Medium	Medium	Slight difficulty	.....
western	25	2120	47	940	No difficulty	Medium	Medium	No difficulty	.....
Larch, western	28	2380	..	....	No difficulty	Medium	Medium	Some difficulty	.....
Pine, jack	24	2040	45	865	Some difficulty	Medium	Medium	Some difficulty	Pitchy
red	27	2300	45	970	Some difficulty	Medium	Medium	Some difficulty	Pitchy
southern	30	2550	47	1125	Heartwood difficult	Long	Medium	Heartwood difficult	Pitchy
white	22	1670	46	810	Some difficulty	Medium	Medium	Some difficulty	Pitchy
Red cedar, western	19	1610	..	....	No difficulty	Medium	Dark	Difficult	Red color
Spruce, black	24	2040	48	920	No difficulty	Medium	Light	No difficulty	Possible pitch
red	24	2040	48	920	No difficulty	Medium	Light	No difficulty	Possible pitch
Sitka	24	2040	49	940	No difficulty	Long	Light	No difficulty	Pitchy
white	24	2040	48	920	No difficulty	Medium	Light	No difficulty	Possible pitch
Tamarack	31	2040	..	....	Heartwood difficult	Medium	Dark	Heartwood difficult	.....

[1] Average values for samples tested at Forest Products Laboratory; wide variations may occur within species.
[2] Based on 85 cu. ft. per cord. Logs 4 feet long with bark on, stacked pile 4 feet high, 8 feet long.
[3] Allowing 6% barking, chipping, and fiber loss.

but they appear to delignify somewhat more rapidly than the spruce. Other conditions being equal, these hardwoods will, therefore, require a shorter cooking time than spruce. The color of the waste liquor at the end of the digestion will be darker than that of spruce but lighter than that of hemlock. The percentage yields by weight of pulp from aspen and cottonwood will be higher than those from most other species because of their higher cellulose contents, and this partially offsets the effect of their low densities on yield per unit of wood volume, as shown in Table II. The aspen and cottonwood pulps will have strength properties, especially tearing strength, inferior to those of pulps from the commonly used conifers. Nevertheless, these hardwood pulps will be valuable for many purposes. Aspen pulp from green wood may have a tendency to be pitchy.

Birch, Beech, Maple, and Tupelo (gum).—The heavier hardwoods, birch, beech, maple, and tupelo, in contrast with the lighter ones discussed above, will make up a heavier digester charge than spruce or hemlock. Sometimes an increase of 20% or more may be realized. Since the volume of acid charged will be equal to or less than that usual with these heavy woods, an increase in the contents of both total and combined sulfur dioxide in the cooking liquor is usually considered essential. The chips from these hardwoods are penetrated by the sulphite acid with slightly more difficulty than spruce, so that a somewhat longer penetration period is generally recommended for the hardwoods. Although birch chips (and probably maple and tupelo) are delignified at the same rate as spruce chips, the dense nature of the wood appears to cause the diffusion of the cooking liquor into and out of the chips to be somewhat slower than for spruce. Consequently, a slower rise to the cooking temperature may be necessary in order to ensure uniform pulping action. The sulphite pulps from birch and tupelo will approach eastern hemlock in all but tearing strength. The maple and beech pulps will be somewhat inferior to the birch and tupelo pulps. White birch pulp will tend to exhibit the same pitchy nature as spruce.

Northern and Western Pines and Western Larch.—These coniferous species, although available in considerable amounts as second-growth material and sawmill waste, have found only limited utilization in the sulphite pulping industry because of the incomplete and unsatisfactory reduction to pulp of some growth types under ordinary sulphite pulping conditions. The difficulty in pulping these species lies in the heartwood. It is well known that the sapwood from these species can be pulped with no trouble. The reasons for the refractoriness of the heartwood toward sulphite pulping liquor cannot be gone into in a report of this kind, but there is evidence that small amounts of certain chemical constituents are present in the heartwood which render the lignin insoluble under the usual conditions of pulping. The difficulties arising from this situation, for which no specific remedy is now available, can be alleviated considerably, however, by cooking these refractory species under milder temperature conditions for longer times and with liquors stronger in sulfur dioxide than normally employed in cooking spruce. Ordinarily, a long cook at a low temperature is not attractive to the quick-cook sulphite operator, but in view of the present shortage of the standard pulpwoods new species and procedures are worthy of serious consideration. Even though, with the suggested modifications, the screenings obtained may be high and the pulp quality inferior, such pulp can find an important place in fulfilling the pulp requirements for the next year. Sawmill waste, if consisting mostly of slabs and edgings, may contain a high percentage of sapwood. In this case pulping processes satisfactory for the common pulpwoods can be applied.

Southern Pine, Tamarack, and Douglas-fir.—The heartwood of the southern pines, tamarack, and Douglas-fir is generally too refractory for the practical application of the sulphite process, although with drastic pulping procedures a low yield of product may result which is suitable for certain chemical derivatives or, where color is not important, for use as an unbleached pulp. The changes in the cooking procedure suggested for the northern pines may be helpful. There may, however, be available to sulphite mills in southern pine areas wood of young growth containing little or no heartwood; or, at sawmills, wastes of southern pine or Douglas-fir slabs and edgings composed predominately of sapwood may be available. In these cases usual sulphite pulping practice can be employed.

Western Redcedar, Sitka Spruce, and Alder.—Western redcedar is reported to be satisfactorily reduced by the sulfite process. The pulp, however, is said to be difficult to bleach and therefore probably would find its best outlet as an unbleached product where color is not important. Sitka spruce is readily reduced by the sulphite process to a high-quality pulp with exceptionally long fibers but with a very high resin content. There appears to be no information available on the sulphite pulping of alder, but presumably it would react similarly to birch or beech.

Mixed Species.—Because of differences in the pulping characteristics of various species it is usually considered to be best practice to pulp them separately. This recommendation is often extended to include widely differing growth types within the same species. Although there are undoubtedly many advantages to be gained from cooking only one kind of wood at one time, the pulping of mixtures of conifers and hardwoods is a practical possibility and has been done in many mills to some extent for a number of years. Certain adjustments in the pulping procedure may be needed. Probably these adjustments should be in favor of species difficult to pulp.

Sulphite Process Variables Affecting Pulp Production

The daily production of a sulphite digester is measured by the amount of pulp made per digester, or the digester yield, and the number of times the digester can produce this pulp in a day, or the digestion cycle. These main factors have subfactors determining their magnitude. Some of the subfactors and their interrelations are outlined in Fig. 1. In considering this chart, it is essential that pulp production be considered in relation to pulp quality. It also must be noted that certain factors, such as wood species and digestion conditions, affect the final product in several perhaps conflicting ways, and should, therefore, be considered on an overall basis. Finally, control of the sulphite process variables to the greatest extent possible is a prime necessity if the pulping reactions are to be conducted so as to get the most out of the wood.

Since the daily digester production is dependent on the yield per digestion and the digestion cycle, it is

obvious that the largest possible amount of pulp of the desired quality that can be produced in the shortest possible time will lead to the greatest daily production. An optimum balance between these two factors thus becomes necessary. Under circumstances of an adequate pulpwood supply and a pressing demand, the emphasis undoubtedly would be on cooking in the shortest time possible. Although a few mills, favorably situated with respect to pulpwood supplies, may find it advantageous to produce pulp under conditions of maximum daily production, most mills under current conditions, prefer to emphasize digester yield in order to obtain the maximum yield per unit of wood volume. As indicated in Fig. 1, digester yield depends on the weight of the wood substance charged as chips and the yield by weight of acceptable pulp, whereas the digestion cycle depends simply on how rapidly the desired product can be made. An examination of the manner in which chip charge and pulp yield are increased or decreased and, to a lesser extent, how the digester cycle is lengthened or shortened by the numerous variables of sulphite pulping, may indicate means for conducting a sulphite digestion to the best advantage of pulp production.

Digester Yield

It would seem to be simple enough to obtain the maximum production from each digestion by insuring, by proper control, that the maximum amount of wood substance enters the digester and the maximum amount of pulp of the desired quality is obtained from this wood charge. In actual operation such control is not entirely possible, since regulation of all the variables is not within the power of the operator. Nevertheless, it is suggested that much can be done to control many of the factors affecting digester yield. In order to govern the controllable factors effectively, however, it is necessary to know to what extent variations influence the digester yield.

Wood Substance Charged.—The actual amount of wood substance charged into a digester depends, in reality, on (a) the average weight of wood substance in each chip of average size and (b) the number of chips in the digester. The maximum charge, then, should be realized by charging the greatest number of chips having the greatest amount of wood substance. Practically, a number of things affect this simple statement. The weight of wood substance in a chip of a given size, e.g., depends primarily on its density, which in turn depends on the species and its growth characteristics. If density were the only consideration, the maximum wood charge would obviously be obtained by using wood of the highest density. The effect of density on pulp yield was explained and illustrated earlier in this report. The advantages gained by using as dense a wood as possible cannot be emphasized too strongly.

The number of chips present in a unit of digester space depends mainly, as indicated in Fig. 1, on (1) the average size and the uniformity of size of the chips, (2) the arrangement of the chips in the digester, and (3) the apparent density of the chip mass. An orderly arrangement of the uniformly sized chips of medium length (½ to ¾ inch) will undoubtedly lead to more efficient use of the digester space and of the wood than an uncontrolled charge of chips varying widely in length and shape. With chips of uniform size there will be less void space and, hence, a larger charge. The pulping reaction will proceed more uniformly, not only within the chips themselves, but also throughout the entire digester charge, and a higher weight yield of pulp will result. It may be necessary, however, to sacrifice to some extent the advantages of chip uniformity, in order to utilize the productive capacity of the chipper to the best advantage.

In mills where the pulpwood supply is adequate, it is desirable to use the digester space as efficiently as possible. This necessitates a dense as well as an orderly arrangement of the chips. The factors affecting the density of the chip charge are weight and the settling of the chip mass in the digester. The density of the wood, the moisture content of the chips, and the height of the digester all affect the weight of the chip mass and its settling. The use of high-density, wet wood, with steaming of the chips during charging, can increase the wood charge as much as 25%. In this step caution is necessary because, with an excessively large charge of wood, there may not be enough acid charged, the acid may

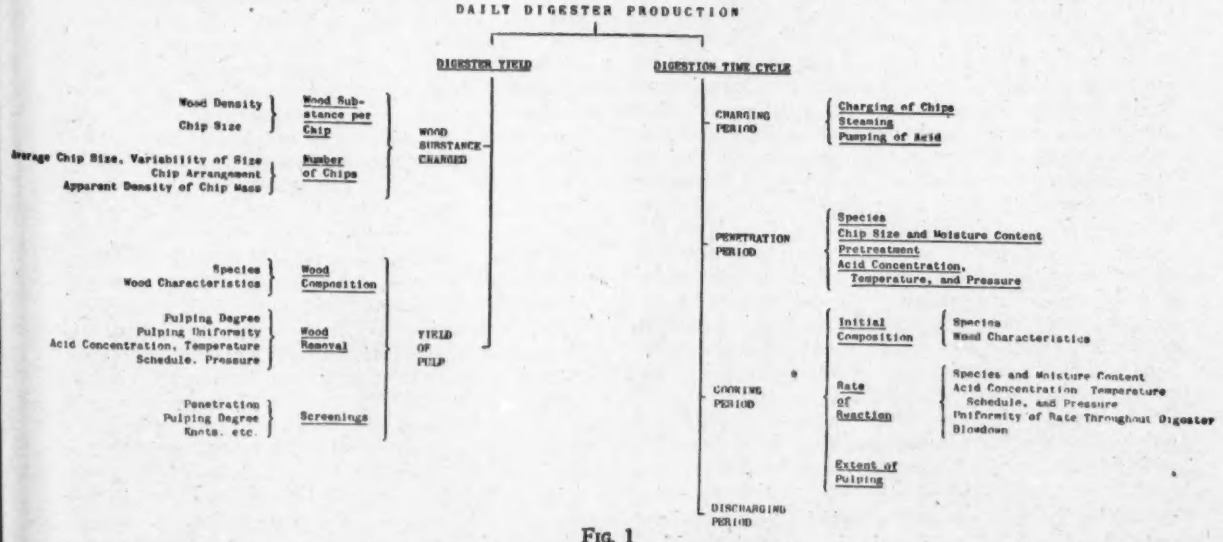

FIG. 1
Sulphite Process Variables Affecting Pulp Production

be too weak to carry on the pulping reactions, or the contents of the digester may not be discharged satisfactorily. Each mill needs to determine the proper balance between the wood charge and the pulping operation.

Percentage Yield.—Whereas the difference in weight of a light wood poorly charged to a digester and a heavy wood well charged may amount to 40%, the maximum variation in yield obtained in pulping a favorable wood with optimum conditions and pulping an unfavorable wood with poor conditions is possibly 20%. Many of the factors contributing to this relatively large variation are within the operator's control, so that their proper regulation may bring about a substantial increase in pulp yield. As shown in Fig. 1, the percentage yield of pulp by weight of wood is determined by (1) the initial cellulose and lignin contents of the wood; (2) the amount of material removed during pulping; and (3) the amount of unpulped material, or screenings. The effect of each of these factors will be considered in some detail.

The highest percentage of cellulosic material obtainable from a given weight of wood is determined by its holocellulose (total carbohydrate fraction) content. The holocellulose values for various pulping species given in Table I show the variation existing between species. Only about two-thirds of the holocellulose is alpha or resistant cellulose, the difference being hemicellulose (polysaccharides and polyuronides). The variation in these cellulose contents accounts for a large part of the difference in sulfite pulp yield from different species and illustrates again a point mentioned earlier, the advantage of using species high in cellulose. It is true that significant differences in cellulose content and pulp yields can also occur within one species because of growth structure, heartwood and summerwood contents, and other variables, adequate discussion of which space does not permit. The lignin and extraneous materials present have an indirect effect on yield, since, if their content is high, the cellulose content must be low.

The amount of wood material made soluble by the sulphite pulping reaction controls the percentage yield of pulp from a particular wood. An ideal pulping process would preserve all the alpha cellulose plus as much of the hemicelluloses, lignin, and extraneous matter as could be included without affecting adversely the quality of the pulp for papermaking or other purposes. Actually, a large portion of the hemicelluloses and a portion of the alpha cellulose which has become nonresistant in the strongly acid conditions prevailing during cooking are made soluble before the desired delignification has taken place. The relative proportions of cellulose and lignin removed depend on the rate and extent of the reactions in-of pulping, (b) uniformity of pulping, and (c) pulping conditions. The first of these factors is generally controlled by the use requirements for the pulp. Since an increase in the chlorine demand of the pulp of 1% is equivalent to an increase of approximately 0.5% in pulp yield, a definite advantage exists in pulping to the highest chlorine demand compatible with the use to which the pulp is to be put.

The maximum yield of pulp is limited by the point at which fiberizing occurs upon discharging the wood from the digester. As this point is approached (55 to 60% yield for most species) the screenings often become excessive because of nonuniform pulping and the yield of useful pulp decreases. To obtain a high utilization of the wood, it may be definitely advantageous to terminate the pulping short of the fiberizing point and to complete the fiberization mechanically. The exceptionally high yields of semichemical pulp thereby resulting will then be limited only by the ability of the material to be blown from the digester, usually near the 60% yield. On the other end of the scale, cooking to a very low lignin content can be disadvantageous from the standpoint of yield of pulp, since the rate of cellulose removed increases rapidly during the final stages of lignin removal.

The effect of uniformity of pulping on percentage yield is concerned mainly with digester operation. A chemical process conducted on as large a scale as is a sulphite digestion is naturally carried out with a certain non-uniformity of cooking temperature throughout the digester. It is believed that some digesters are operated with too little regard for this point. Since in zones of high temperature in the digester the pulp is being overcooked, with the reverse occurring in zones of low temperature, the resulting nonuniform pulp, although possibly having the overall desired chlorine demand, will be produced in reduced yield. This reduction, which may amount to as much as 2% in yield, can be lessened by an orderly arrangement of the chips in the digester and other means provided for circulation of the liquor, which will result in uniform temperature conditions throughout the digester. There is also the possibility of nonuniform pulping within the individual chips themselves. Large, thick chips, although not showing evidence of "burning," may be less completely pulped in their centers than on their exteriors. In this case the remedy lies in the use of small, more readily pulped chips.

The third point mentioned above, that of the effect of pulping conditions on percentage yield, can be of considerable importance. The concentration of the cooking liquor affects the relative rates of solution of the lignin and the cellulosic substances. An increase in the excess sulfur dioxide content, other things being equal, causes a slight decrease in yield, although generally this decrease can be more than offset by adjustments in the other conditions which are allowed by the use of the increased acid strength. An increase in the concentration of combined sulfur dioxide of approximately 0.2% (at a constant acid-wood ratio), on the other hand, is reported to bring about a yield increase of 1%. This increase is mainly in the hemicellulosic constituents, whose retention in the pulp may or may not affect its quality; for example, pulp for glassine can contain these constituents to advantage, but in pulp for rayon their presence can be tolerated only in very small amounts. The limited range of variation in combined sulfur dioxide concentration which is available to the acid maker makes the overall variation in pulp yield from this source about 3%. The percentage yield is definitely unfavorably affected by high pulping temperatures. An increase in temprature of 5° C. within the usual range of pulping temperature causes a yield loss of approximately 1 pound of pulp for every 100 pounds of moisture-free wood charged to the digester. This loss is somewhat higher at higher temperatures and lower at lower temperatures. It is apparently good advice from a standpoint of yield to select the lowest cooking temperature which will give the required pulping action in the

available time. Digester pressure has an indirect effect on yield in that it controls the concentration of excess sulfur dioxide available at the cooking temperature.

The screenings, or incompletely pulped chips, which do not readily fiberize upon discharge of the digester represent for the most part a loss as far as higher grade sulfite pulp is concerned. It is obvious that each pound of screenings avoided means approximately an additional pound of usable pulp produced. Although screenings after suitable refining do have some fiber value (and they should be so utilized as much as possible under present conditions) their production means a partial loss of valuable raw material. When cooking proceeds beyond the fiberizing point, screenings arise mainly from the formation of insoluble lignin compounds in the interior of the chip, caused by an incomplete penetration of the bisulphite at the cooking temperatures. The cooked chips then possess the familiar dark, hard centers. The production of this type of screenings can be avoided by any means that will ensure the presence of the bisulfite in the chip before the maximum pulping temperature has been reached. Obvious remedies are (1) a longer time at the penetration temperature, (2) a high concentration of excess sulfur dioxide (which aids bisulphite penetration), and (3) use of small, uniform chips. A less serious source of screenings, or tailings, is the chip that is uniformly but not quite completely delignified past the fiberizing point. This type of screenings is caused by zones of low temperatures or by insufficient chemical in the digester, the remedies for which are obvious. In the case of a semichemical digestion, all of the cooked chips will, of course, be of this type. Other sources of screenings are the nonpulpable knots and bark that unavoidably accompany the chips. Preparation of the chips in such a way as to keep fiber loss at a minimum may mean, on the other hand, a relatively high percentage of the last-mentioned type of screenings.

Digestion Cycle

Normally, a high pulp demand can be met by increasing the digester output through decrease of the "cover to cover" cooking time to the extent that a satisfactory pulp is produced with no serious disruption of the chip, acid, and pulp flow through the digestion operation. A decrease in the time may be advantageous, even if at some expense of the yield of pulp from the wood. Under these conditions, the factors affecting the number of blows per day are of prime importance. In most mills today, however, the yield of pulp is the more important of the two chief factors affecting digester production. Nevertheless, the factors affecting the digester cycle have an indirect bearing on the yield and therefore merit brief mention. The digestion cycle can be conveniently divided into (1) charging, (2) penetration, (3) cooking, and (4) discharging periods.

Charging Period—Raw materials should be charged in the digester in a minimum time consistent with having the materials in the most favorable condition for the penetration period. This means that sufficient time should be allowed for chip charging, so that a desirable orderly arrangement is obtained. The importance of proper chip arrangement with respect to uniformity of pulp and pulp yield has already been stressed. Although steaming the digester during or after the chip charging is not universal procedure, the time so spent may be well worth while from the standpoints of increased wood charge, moisture uniformity, and penetrability. The acid pump should be of adequate size, and there appears to be no advantage in pumping the acid at a rate below its maximum capacity.

Penetration Period—As mentioned earlier, penetration of sulphite cooking liquor must be substantially completed before a certain critical temperature is reached if burned centers in the wood chips are to be avoided. To insure the best yield, therefore, an adequate time should be allowed for penetration. In addition to chip size, the penetration time is dependent on (1) species and structural features of the wood, (2) chip moisture content, (3) pretreatment, (4) penetration conditions. A detailed discussion of these factors cannot be given here, but certain highlights may be helpful. As far as wood species and structure are concerned, the spruces, firs, and poplars are somewhat more readily penetrated than dense hardwoods and the pines; sapwood is more rapidly penetrated than heartwood, and springwood more rapidly than summerwood. Chips with a uniform moisture content are more satisfactorily penetrated than those of varying moisture content. Pretreatment, e.g., precirculation of hot acid, enables a considerable shortening of the normal penetration time. A high sulfur dioxide content in the liquor aids the penetration of the bisulphite, and the higher the penetration temperature (below the critical temperature) the more rapid the penetration. A high operating pressure, permitted by high sulphur dioxide concentrations, indirectly aids penetration.

Cooking Period—Dissolution of the lignin in the wood, which is the prime purpose of the cooking period, depends on many factors, as shown in Fig. 1. Essentially, the time required for lignin removal depends on the amount initially present, the rate of its removal, and the amount left in the pulp. Certain species, or growth types within species, may require a longer cooking time or a faster pulping rate than others because of a high initial lignin content; further, because of a low cellulose content in such wood, the additional pulping may cause the normally low yield of pulp to be still lower. As explained before, lignin and valuable cellulosic material are removed concurrently. For the highest cellulose yield, it is necessary to balance these two reactions, possibly at the expense of cooking time. Since the most important single factor determining the rates of reaction is temperature, the temperature schedule used should be that which results in the most rapid removal of lignin consistent with minimum cellulose removal. Generally this condition is satisfied at temperatures below 140° C. In this connection a uniform temperature throughout the digester is a necessary condition for a controlled balance of the pulping reactions.

A less important factor affecting the reaction rates is cooking liquor concentration; an increase in total sulfur dioxide increases the rates of reaction of the cooking liquor with the lignin and the cellulose, and an increase in combined sulfur dioxide acts in the opposite way.

Another factor affecting the reaction rates in the cooking period is the blowdown time. A lengthy blowdown lowers the reaction rates because of removal of sulfur dioxide. A blowdown accompanied by steaming for high chemical recovery may be unfavorable to pulp yield, because of the resulting dangerously localized high temperatures and presence of organic acids.

The final factor affecting the cooking period is the degree of pulping. This variable is complementary to pulp yield. Other conditions being the same, the less a pulp is delignified (by use of a shorter cooking time) the higher is the yield obtained. As has been emphasized, it is desirable to produce the highest yield possible for the particular use requirements of the pulp.

Discharging Period—The final period of the digester cycle, the time consumed in discharging the digester, is affected by the method of discharge, whether by blowing or dumping. Digester yield is not believed to be related to this operation.

Sulphite Mill Fiber Loss

Although the main purposes of this report were to point out possible sources of pulpwood not now utilized and to discuss the factors affecting the yield of pulp from the wood in the digestion itself, there are other operations in the sulphite mill, such as chip preparation and pulp washing, screening, and bleaching, which can bear close scrutiny in the interest of increased pulp production. These operations are often the source of considerable fiber loss. For instance, intense wood cleaning may be accompanied by as much as a 15% wood loss, several percent of the potential paper production may be going to the sewer as a fiber loss, and bleaching shrinkage may amount to as much as 5 to 10%. All of these operations merit a careful check by the operator to determine whether the losses are at a minimum. Since each mill operates individually in its wood preparation, chipping, washing, screening, and bleaching setups, only a few general observations can be made here.

In order to realize the maximum amount from each log entering the mill, it may be advisable to sacrifice pulp cleanliness to some extent. This means that the barking and wood cleaning operations should be conducted so as to remove a minimum of good fiber at the expense, perhaps, of leaving an appreciable amount of dirt-producing material with the chips. This scheme will throw an increased burden on the pulp screens. The slashing, sawing, and chipping operations should be done to produce a minimum of fine material. The chip screening operation should eliminate only the decidedly objectionable material. The chips that then go into the digester will be somewhat nonuniform in size, and adjustments in the cooking procedure may be needed to counteract this. The use of the pin chips and coarse sawdust from the chip screens should warrant consideration. For example, the pin chips may be cooked in a mixture with the regular chips or separately.

The white water from washers and the thickeners can be used to supply part of the wash water in the blowpit. In this way the fibers are filtered from the white water. There should, if at all possible, be some kind of fiber recovery system for the white water. The pulp screenings should all be collected, refined if need be, and utilized in such products as roll wrapper, car liner, and board filler. The rejects from the knotter screen can be refined in a hammermill and blended with the screenings. The screen efficiency should be high so that the screenings contain as little acceptable fiber as possible.

The relatively low pulp brightness ceiling now permitted makes it possible to conduct the bleaching operation with a low shrinkage. A single stage hypochlorite bleach may produce a pulp with the necessary brightness without the losses of carbohydrate materials which occur in multiple stage bleaching, especially in those employing caustic extraction.

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J. H. Hinman Heads Paper Div.

J. H. Himan, president of the International Paper Company, has accepted the chairmanship of the Paper and Stationery Division for the Fourth War Loan. Announcement of this was made by John A. Brown, President of the Socony-Vacuum Oil Company, chairman of the Industrial section of the Commerce and Industry Division of which William E. Cotter, of the Union Carbide and Carbon Company is director.

Mr. Hinman, assisted by committeemen to be appointed, will ask each of the more than 600 concerns in the Paper and Stationery Division to cooperate with the Treasury Department in the sale of the Fourth War Loan bonds by having a company representative appointed.

"The purchase of war bonds serves two purposes," said Mr. Cotter. "First it will speed victory by making available funds for the purchase of arms and ammunition for our men engaged in this global war. We cannot fail them. Secondly, looking at it from a selfish viewpoint, war bonds are the soundest investment that may be made."

"The purchase of bonds is not a demand made of an individual. It is an offer to those at home to serve and serve. Were this other than a nation with a government by and for the people, the money needed to pay the cost of war could readily be obtained through taxation or confiscation. 'Let's all back the attack' and not only buy bonds, but keep them."

The Fourth War Loan bond sales will begin January 18 and extend through February 15th, 1944. Employees of the Manhattan area are being asked to subscribe to $581,000,000 worth of bonds.

Not to Build Chipping Plant

[FROM OUR REGULAR CORRESPONDENT]

VICTORIA, B. C., December 18, 1943—W. O. McPherson, wood fuel officer, department of munitions and supply at Victoria, B. C., states he has been advised International Pulp and Paper Company had abandoned their plans for a chipping plant in Victoria. The plant would have taken 150 cords of millwood a day to operate—the equivalent of all the millwood coming into the city daily.

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After the war competition in industry will be keener than ever before. Many millions of people who have been mobilized for war will be turned back into normal pursuits. New industries, new processes and new markets will dominate the economic picture.

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New York Paper and Pulp Market Review

WPB Announces U. S. Government Will Buy Canadian Newsprint Shipments Above 182,000 Tons Monthly To Form Stockpile—Paper And Pulp Markets Strong — Mills Report Need of Waste Paper.

Office of the PAPER TRADE JOURNAL.
Wednesday, December 29, 1943.

Little recession in the heavy demand for paper is reported over the holiday. With government requirements for military and lend-lease shipments increasing for wrapping paper and paper board, these items are in tight supply. Direct war uses for packing and shipping containers, according to government reports, are expected to increase in the immediate future.

Current reports from most of many manufacturers' representives, jobbers, and general paper merchants indicate the expectancy of less favorable business prospects in 1944 than during the current year. Many reflect the opinion that there will be much less paper available for civilian use as more and more uses are almost constantly being found for paper for war requirements.

The index of general business activity for the week ended December 18 declined to 143.7, from 148.0 for the previous week, compared with 135.5 for the corresponding week last year. The index of paper board production was 149.0, compared with 152.2 for the previous week, and with 135.0 for the corresponding week last year.

Paper production for the week ended December 18 was estimated at 89.1%, compared with 87.9% for 1942, with 107.3% for 1941, with 88.5% for 1940, and with 97.2% for the corresponding week for 1939.

Paper board production for the week ended December 18 was 96.0%, compared with 85.0% for 1942, with 101.0% for 1941, with 80.0% for 1940, and with 81.0% for the corresponding week for 1939.

The paper industry is facing a critical situation, Red W. Hovey, Director of the Paper Division, War Production Board, told the newly organized WPB Paper Industry Advisory Committee, at their first meetings in December. The WPB announced last week that newsprint shipments from Canada to the U. S., that may be available in excess of 182,000 tons monthly, will be bought by the U.S. Government to form a stockpile to insure adequate supply for the second half of 1944.

Wood Pulp

Mill demand for all grades of wood pulp continues heavy and in excess of suplies. Shipments, according to some quarters, are going forward reasonably satisfactorily.

Canadian shipments to the U. S. will be at the annual rate of 1,100,000 tons, the W.P.T.B. has announced, to become effective on January 1, 1944. The distribution of pulp shipments will be further discussed with WPB, it was stated. By the extension of sulphite pulp with clay filling material it is hoped to increase the newsprint tonnage by about 4%.

Rags

Mill demand for new white, bleached grades of cotton cuttings is reported active at full ceiling prices.

Roofing rags are in heavy demand and orders are being booked ahead by many mills to insure adequate supplies.

Old Rope and Bagging

Mill demand for old Manila rope continues to absorb all available supplies.

The OPA has established a lower maximum price on No. 1 Small Old Sisal Rope, from $85 to $80 per short ton. The No. 1 Clean Bright Sisal String grade, has been combined with the former and becomes effective on December 29, 1943.

Trading in scrap bagging is currently reported as moderatively active. Prices are firm and continue to be reported as nominal.

Old Waste Paper

Mill demand for paper stock is heavy and in excess of available supplies.

The OPA has tightened regulations on sales of unsorted waste paper, which may not exceed the price permitted for No. 1 mixed paper. This becomes effective on January 3, 1944.

Twine

The WPB has announced that Edwin R. Metcalf, formerly of the Columbian Rope Company, has succeeded Arthur R. Howe, who has resigned, as Chief of the Cordage Branch. Mr. Metcalf has been chief of the Rope and Twine Section of the Cordage Branch.

Navy to Use Paper "Wipe"

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., December 29, 1943—A paper substitute for wiping rags that may be a boon to postwar housewives and mechanics has been developed by the U. S. Navy, it is announced by Rear Admiral William B. Young, Supply Corps, U. S. Navy, Chief of the Bureau of Supplies and Accounts.

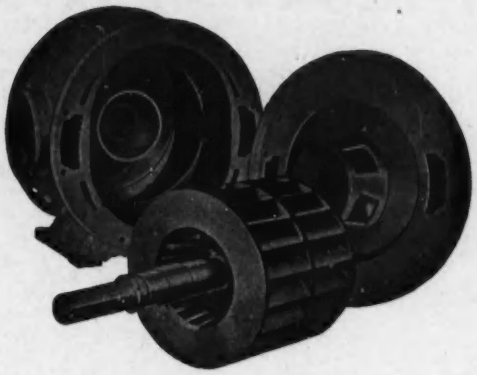
More than 1,000,000 pounds of the new paper wipe have been delivered on experimental orders. Extensive tests at Naval depots and aboard ships show it to be superior to rags for some cleaning purposes, although somewhat inferior in rapidity of oil absorption qualities.

The new paper product costs less than cloth, both per pound and per unit of area, and requires less storage space. It is soft, retains maximum strength when wet, and is free from lint, grit and acidity.

Research to find a satisfactory substitute for wiping rags, of which the Navy uses about 65,000,000 pounds a year, was started in the Bureau of Supplies and Accounts last summer when the Clothing Division foresaw a rag shortage. The Paper and Paper Products Section of the Stock Division worked with the paper industry in developing the sheet of paper from which the new wipe was produced.

It is estimated that approximately 20,000,000 pounds of paper wipe will be used by the Navy during 1944.

SIMPLICITY



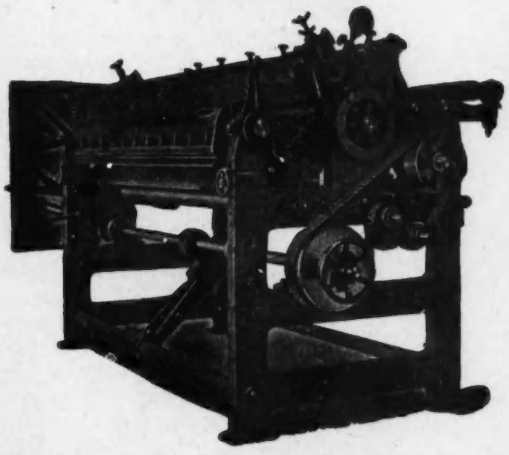
NASH VACUUM PUMPS HAVE ONE MOVING PART

Operating advantages made possible by the Nash principle, and present in no other type of vacuum pump, permit a new level of operating economy. Nash Vacuum Pumps have but one moving part, a rotor cast in one piece, and revolving without metallic contact. There are no valves, no pistons or sliding vanes, no internal parts requiring wear adjustment or lubrication.

NASH ENGINEERING COMPANY
SOUTH NORWALK, CONNECTICUT, U. S. A.

MODEL 28

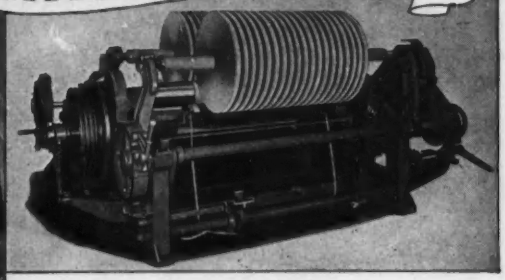
ROLLER BEARING CUTTER



HAMBLET MACHINE CO.
LAWRENCE, MASS.

MAKERS OF
SINGLE, DUPLEX AND DIAGONAL PAPER CUTTERS
CUTTER KNIVES, PATENT TOP SLITTERS.

Another WAR JOB for CAMACHINE 28-3



AIR AND OIL FILTERS help to keep our planes flying and our motorized equipment rolling. In mechanized warfare, millions of paper filter discs are needed. These discs are stamped out of specially treated paper. Jumbo rolls of the treated paper are slit into strips of the width required and rewound onto rolls ready to feed to die-cutting machines. Converting these rolls is a **CAMACHINE** job. **CAMACHINE** 28-3 does it so fast and so well that one **CAMACHINE** is sufficient to keep 20 die-cutting presses supplied with paper. Write for interesting folder.

CAMERON MACHINE COMPANY, 61 Poplar Street, Brooklyn, New York
MIDWEST OFFICE: Harris Trust Building, 111 West Monroe Street, Chicago

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PERFORMANCE of your Centrifugals, Shakers and Drainers definitely improved by the use of precision screens built to your specifications. Let us "sit in" on your screening problems.

The Harrington & King PERFORATING Co.

5652 Fillmore St., Chicago 44, Ill.—114 Liberty St., New York 6, N. Y.

MISCELLANEOUS MARKETS

Office of the PAPER TRADE JOURNAL.
Wednesday, December 29, 1943.

BLANC FIXE—Prices on blanc fixe continue to conform to prevailing quotations. Demand is reported fair. The pulp is quoted at $40 per ton, in barrels, at works. The powder is quoted at $60 per ton, f.o.b. works.

BLEACHING POWDER—Demand is reported active with the supply situation satisfactory. Quotations are unchanged. Bleaching powder is currently quoted at from $2.50 to $3.10 per 100 pounds. All prices in drums, car lots, f.o.b. works.

CASEIN—OPA maximum prices on processed acid-precipitated casein are as follows: 10,000 pounds or more, 24 cents per pound; 2,000 pounds, 24¼ cents per pound; less than 2,000 pounds, 24¾ cents per pound, f.o.b. shipping point. Imported, 11 cents per pound, f.o.b. source.

CAUSTIC SODA—Contract orders absorbs about all available supply. Market rather quiet this week. Prices continue unchanged. Solid caustic soda is currently quoted at $2.30 per 100 pounds. The flake and ground are currently quoted at $2.70 per 100 pounds. All prices in drums, car lots, f.o.b. works.

CHINA CLAY—Current demand is reported moderate on many grades of china clay. Quotations continue to conform to prevailing prices. Domestic filler clay is quoted at from $7.50 to $15 per ton; coating clay is currently quoted at from $12 to $22 per ton, at mines. Imported china clay is currently quoted at from $13 to $25 per long ton, ship side.

CHLORINE—Demand for chlorine heavy with civilian supply still tight. Prices continue unchanged. Chlorine is currently quoted at $1.75 per 100 pounds, in single-unit tank cars, f.o.b. works.

ROSIN—The rosin market reports lower prices, on some grades this week. "G" gum rosin is currently quoted at $4.00 per 100 pounds, in barrels, at Savannah. "FF" rosin is currently quoted at $3.97 per 100 pounds, in barrels, at New York. Seventy per cent gum rosin size is currently quoted at $4.26 per 100 pounds, f.o.b. works.

SALT CAKE—Prices on salt cake continue to be reported unchanged. Demand is moderate for the current week. Domestic salt cake is currently quoted at $15 per ton, in bulk. Chrome cake is currently quoted at $16 per ton. All quoted prices in car lots, f.o.b. shipping point.

SODA ASH—The supply situation in soda ash continues tight under a very heavy demand. Shipments going forward without delay. Some imports have arrived. Prices continue to conform to prevailing levels. Quotations on soda ash in car lots, per 100 pounds, are as follows: in bulk, $.90; in paper bags, $1.05; and in barrels, $1.35.

STARCH—Cash corn available for trade consumption continues limited and market is still tight on corn and corn products. Prices unchanged on starch. Pearl is quoted at $3.10 per 100 pounds. Powdered starch is quoted at $3.20 per 100 pounds. All prices in bags, car lots f.o.b. Chicago.

SULPHATE OF ALUMINA—The supply situation in sulphate of alumina is reported satisfactory. Prices of the commercial grades are currently quoted at from $1.15 to $1.25 per 100 pounds. The iron free is currently quoted at $2.35 per 100 pounds. All prices in bags, car lots, f.o.b. works.

SULPHUR—Current consumption of sulphur continues heavy with no change in the market situation. Quotations on annual contracts are unchanged at $16 per long ton, f.o.b. mines. The current price on contracts at Gulf Ports continues unchanged at $17.50 per long ton.

MARKET QUOTATIONS

All market quotations, excepting those otherwise designated as official OPA maximum prices, are based on the manufacturers' price level as of October 1-15, 1941; maximum wholesale prices are based on the merchants' maximum prices for stipulated quantities at a quoted price to all customers of a like class, as shown by the merchant's sales records of goods delivered during March, 1942. A merchant's price list in effect in March 1942, showing quotations of actual shipments, will establish the current maximum prices.

Paper

(Delivered New York)

News, per ton—			
Roll, contract	*$58.00	@	—
Sheets	64.00	"	—
* OPA Maximum Price.			
Kraft—per cwt.—Carload Quantities Zone A, f.o.b. Mill			
Superstandard Wrapping	*$5.25	@	—
No. 1 Wrapping	*5.00	"	—
Standard Wrapping	*4.75	"	—
Standard Bag	*4.375	"	—
* OPA Manufacturers' Prices.			
Tissues—Per Ream—Carlots			
White No. 1	1.12½	"	—
White No. 1 M. G.	1.10	"	—
White No. 1½	1.00	"	—
White No. 2	.90	"	—
Anti-Tarnish M.F.	1.20	"	—
Colored	—	"	—
Kraft	.95	"	—
Manila	.90	"	—
Toilet—1 M. Sheets—Per Case			
Unbleached	4.25	"	—
Bleached	5.70	"	—
Unbl. Toilet, 1 M.	4.16	"	—
Bleached Toilet	5.70	"	—
Paper Towels, Per Case—			
Unbleached, Jr.	2.60	"	—
Bleached, Jr.	3.20	"	—
Manila—per cwt.—C. l. f. a.			
No. 1 Jute	11.25	@	—
No. 1 Manila Wrapping, 35 lb.	6.00	"	6.25
No. 2 Manila Wrapping, 35 lb.	5.75	"	6.00
Boards, per ton—			
News	*48.00	@	—
Chip	*48.00	"	—
Sgl. Mla. Lt. Chip	*60.00	"	—
White Pat. Coated	*75.00	"	—
Kraft Liners 50 lb.	*63.00	"	—
Binders Boards	84.00	"	116.00

* OPA Base Prices per 10 tons. Less than 10 tons but over 3 tons, add $2.50; three tons or less, add $5; regular 35-39 basis, add $5.; basis 40-49, add $2.50; basis 91-100, add $2.50; basis 101-120, add $5.

The following are representative of distributors' resale prices:

Rag Content Bonds and Ledgers—White, Assorted Items, Delivered in Zone 1:

	Bonds		Ledgers
100% Rag Ext.			
No. 1	$39.10 @ $46.00		$40.25 @ $47.25
100% Rag	32.20 " 37.75		33.35 " 39.25
85% Rag	.... "		29.90 " 35.00
75% Rag	23.00 " 27.00		24.15 " 28.25
65% Rag	.... "		22.80 " 27.75
50% Rag	18.70 " 22.75		19.90 " 24.25
25% Rag	16.40 " 20.00		17.55 " 21.50

Colors at $1.00 cwt. extra.

Sulphite Bonds and Ledgers—White, Assorted Items. Delivered in Zone 1:

	Bonds	Ledgers
No. 1	$10.55 @ $12.75	$11.70 @ $14.25
No. 2	9.65 " 11.75	10.80 " 13.25
No. 3	9.20 " 11.25	10.35 " 12.50
No. 4	8.90 " 10.75	10.05 " 12.25

Colors $1.00 cwt. extra.

Free Sheet Book Papers—White, Cased Paper. Delivered in Zone 1:

No. 1 Glossy Coated	$13.65 @	$13.50
No. 2 Glossy Coated	12.40 "	14.00
No. 3 Glossy Coated	11.60 "	13.25
No. 4 Glossy Coated	11.15 "	12.75
No. 1 Antique (watermarked)	10.25 "	11.75
No. 2 Offset	9.60 "	11.00
A Grade E. F.	9.35 "	10.75
A Grade S. & S. C.	9.60 "	11.00
B Grade E. F.	8.85 "	10.25
B Grade S. & S. C.	9.10 "	10.50
C Grade E. F.	8.55 "	9.75
C Grade S. & S. C.	8.80 "	10.00
D Grade E. F.	8.25 "	9.50
D Grade S. & S. C.	8.50 "	9.75

Ivory & India at $.50 cwt. extra.

Wood Pulp

OPA Maximum Prices and Canadian Manufacturers Prices, Less Freight, Not Exceeding OPA Allowances.

Bl. Softwood Sulphite		$76.00
Unbl. Softwood Sulphite	65.00 @	66.00
Bl. Hardwood Sulphite		73.50
Unbl. Hardwood Sulphite		63.50
Bl. Mitscherlich		81.00
Unbl. Mitscherlich	72.00 @	82.00
N. Bleached Sulphate		86.00
S. Bleached Sulphate		79.00
N. Semi-Bleached Sulphate		82.00
S. Semi-Bleached Sulphate		75.00
N. Unbl. Sulphate		73.00
S. Unbl. Sulphate		63.50
Bl. Soda		66.00
Unbl. Soda		62.00
Groundwood		46.00

Transportation Allowances Applying to Producers of Wet Wood Pulp.

	Below 50% Air Dry Weight
Northeast	$13.50
Lake Central	13.50
Southern	16.00
West Coast (in area)	10.50
West Coast (out area)	16.50

	50%-80% Air Dry Weight
Northeast	$11.50
Lake Central	11.50
Southern	14.00
West Coast (in area)	9.50
West Coast (out area)	15.50

Applying to Producers of Dry Wood Pulp.

	Above 80% Air Dry Weight
Northeast	$8.50
Lake Central	8.50
Southern	11.00
West Coast (in area)	7.50
West Coast (out area)	13.50

Should freight charges actually exceed these allowances, the difference may be added to the maximum prices

Domestic Rags

New Rags

(Prices to Mill f. o. b. N. Y.)

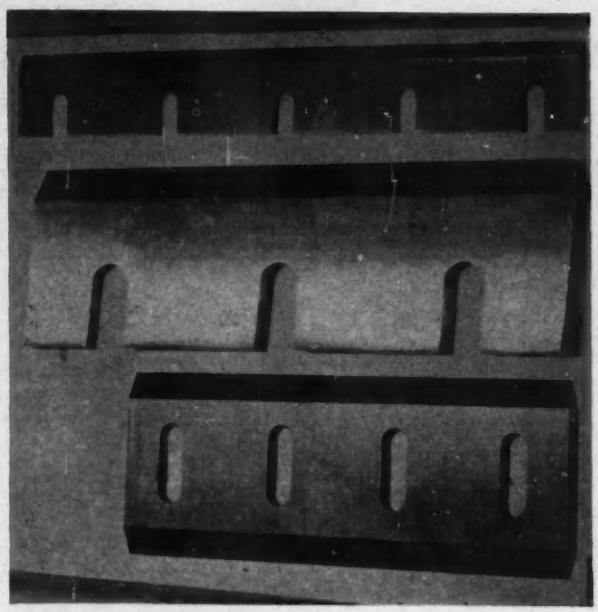
Shirt Cuttings—			
New White, No. 1	6.50	@	7.25*
Silesias No. 1	—	"	5.75*
New Unbleached	6.75	"	7.50*
Blue Overall	—	"	5.50*
Fancy	—	"	3.50*
Washables	—	"	3.00*
Bleached Khaki Cuttings	—	"	4.25*
Unbleached Khaki Cuttings	—	"	3.50*

* OPA Maximum Prices.

UNION EQUIPMENT

We can still supply information and help in maintaining your *Union* equipment. We are sorry, but we can't supply you with new installations. If it is a matter of keeping present machines running, we will be glad to do all we can.

UNION MACHINE COMPANY
FITCHBURG, MASS.
(Associated with Union Screen Plate Company)



FOR KNIVES ALSO—

For more than three quarters of a century Taylor-Stiles & Co. have made knives, not only for our own cutters but for all kinds of industrial machines.
Our methods and equipment are modern and efficient. Come to us for knives or knife maintenance.

TAYLOR STILES & COMPANY
14 Bridge St. Riegelsville, N. J.

PRICE & PIERCE »»»»»»»»ltd•

Wood Pulp & Paper Agents

60 East 42 Street New York, N. Y.

West Virginia Pulp and Paper Company

230 Park Ave. New York
35 East Wacker Drive Chicago
Public Ledger Building Philadelphia, Pa.
503 Market St. San Francisco, Cal.

Manufacturers of

ENGLISH FINISH SUPERCALENDERED MACHINE FINISHED BOOK and LITHOGRAPHIC PAPERS

Offset, Envelope, Bond, Writing, Mimeograph, Ledger, Eggshell, Cover and Music Papers, Index Bristol, Post Card and Label Papers

HIGH GRADE COATED BOOK

• • • •

KRAFT WRAPPING AND KRAFT ENVELOPE
KRAFT LINER BOARD
BLEACHED SULPHITE AND SODA PULP
BLEACHED AND UNBLEACHED KRAFT PULP

MILLS:

Mechanicville, New York
Luke, Maryland
Covington, Virginia
Tyrone, Pennsylvania
Williamsburg, Pennsylvania
Charleston, South Carolina

Old Rags

White, No. 1—			
Repacked	*3.80	"	—
Miscellaneous	*3.20	"	—
White, No. 2—			
Repacked	*2.90	"	—
Miscellaneous	*2.65	"	—
Third and Blues—			
Repacked	*2.30	"	—
Miscellaneous	*1.80	"	—
Roofing Rags—			
No. 1	*1.55	"	—
No. 2	*1.45	"	—
No. 3 (bagging)	*1.35	"	—
No. 4	*1.35	"	—
No. 5A	*1.35	"	—
Old Manila Rope	5.75	"	—

OPA Maximum Prices.

Foreign Rags

All Prices nominal

New Rags

New Dark Cuttings	2.25	●	2.40
New Mixed Cuttings	2.00	"	2.20
New Light Silesias	5.50	"	5.75
Light Flannelettes	5.50	"	5.75
New White Cuttings	7.00	"	7.50
New Light Oxfords	4.00	"	4.50
New Light Prints	3.00	"	3.25

Old Rags

No. 1 White Linens	7.50	"	8.50
No. 2 White Linens	6.50	"	7.50
No. 3 White Linens	4.50	"	—
No. 4 White Linens	2.25	"	3.25
No. 1 White Cotton	4.25	"	4.75
No. 2 White Cotton	3.25	"	3.75
No. 3 White Cotton	2.50	"	3.00
No. 4 White Cotton	1.90	"	2.20
Extra Light Prints	2.00	"	2.40
Ord. Light Prints	1.75	"	2.15
Med. Light Prints	1.55	"	1.95
Dutch Blue Cottons	2.25	"	2.50
French Blue Linens	3.00	"	—
Checks and Blues	2.00	"	—
Linsey Garments	1.90	"	2.00
Dark Cottons	1.50	"	1.60
Old Shopperies	1.30	"	1.45
New Shopperies	1.45	"	1.50
French Blues	2.25	"	2.50

BAGGING

(Prices to Mill, f. o. b. N. Y.)

Gunny No. 1—			
Foreign	Nominal		
Domestic	4.25	●	4.35
Wool Tares, light	4.25	"	4.50
Wool Tares heavy	4.50	"	5.00
Bright Bagging	4.50	"	4.85
Manila Rope—			
Foreign	—	"	—
Domestic	*5.75	"	—
Jute Threads	5.50	"	—
No. 1 Sisal Strings	*4.00	"	—
Mixed Strings	2.00	"	—

* OPA Maximum Price.

Old Waste Papers

(F. o. b. New York)

OPA Maximum Prices

No. 1 Hard White Envelope Cuts, one cut	3.37½	●	—
No. 1 Hard White Envelope Cuts	3.12½	"	—
No. 1 Hard White Shavings, unruled	2.87½	"	—
No. 1 Hard White Shavings, ruled	2.50	"	—
Soft White Shavings, one cut	2.87½	"	—
No. 1 Soft White Shavings	2.50	"	—
Soft White Shavings, Misc.	2.15	"	—
No. 1 Fly Leaf Shavings	1.67½	"	—
No. 2 Fly Leaf Shavings	1.12½	"	—
No. 1 Groundwood Fly Leaf Shavings	1.25	"	—
No. 2 Mixed Groundwood Fly Leaf Shavings	.90	"	—
Mixed Colored Shavings	.75	"	—
Mixed Groundwood Colored Shavings	.90	"	—
Overissue Magazines	1.67½	"	—
No. 1 Heavy Books & Magazines	1.67½	"	—
Mixed Books	.85	"	—
No. 1 White Ledger	2.17½	"	—
No. 2 Mixed Ledger, colored	1.87½	"	—
New Manila Envelope Cuttings, one cut	2.87½	"	—
New Manila Envelope Cuttings	2.65	"	—
Extra Manilas	1.85	"	—
Mixed Kraft, Env. & Bag Cuttings	2.75	"	—
Kraft Envelope Cuttings	3.25	"	—
Triple Sorted, No. 1 Brown Soft Kraft	2.50	"	—
New 100% Kraft Corrugated Cuttings	2.25	"	—
No. 1 Assorted Old Kraft	1.75	"	—
New Jute Corrugated Cuttings	.90	"	—
Old 100% Kraft Corrugated Containers	1.75	"	—
Old Corrugated Containers	1.15	"	—
Box Board Cuttings	.72½	"	—
White Blank News	1.65	"	—
Overissue News	.85	"	—
No. 1 News	.75	"	—
No. 1 Mixed Paper	.70	"	—
Old Corrugated Containers	.82½	"	—
Mill Wrappers	.85	"	—

Twines

All Prices Nominal

(F. o. b. Mill)

(Soft Fiber)

Coarse Polished—			
India	.21	●	—
White Hemp	.21	"	—
Fine Polished—			
Fine India	.26	"	—
Unpolished—			
Box	17½	"	—
Paper Makers	.17	"	—
Tube Rope	19	"	—
Wall Paper	.20½	"	—
Wrapping	.23	"	—
Soft Fiber Rope	.19	"	—
Cotton	25	"	—

(Hard Fiber)

Medium Java	.18	"	—
Mex. Sisal	.16	"	—
Manila		"	—

PHILADELPHIA

Domestic Rags (New)

(Price to Mill, f. o. b. Phila.)

Shirt Cuttings—			
New White No. 1	.07¼	●	.07½
New White No. 2	.04½	"	.05
Light Silesias	.04½	"	.04¾
Silesias, No. 1	.04	"	.04¼
Black Silesias, soft	.03¾	"	.04
New Unbleached	.07¼	"	.07½
Washable Prints	.03¾	"	.03½
Washable No. 1	.02	"	.02¼
Blue Overall	.04½	"	.05½
Cottons—According to grades—			
Washable shredding	—	"	.01¾
Fancy Percales	.03¼	"	.03½
New Black Soft	.02¾	"	.03
New Dark Seconds	1.75	"	2.00
Khaki Cuttings—			
No. 1 O. D.	.03	"	.03¼
No. 2 Mixed	.02¼	"	.02½
Corduroy	.01¾	"	.02¼
New Canvas	.04¾	"	.05¼
New Black Mixed	—	"	.02½

Domestic Rags (Old)

White No. 1—Repacked	3.80	"	—
White No. 2—Repacked	2.90	"	—
Miscellaneous No. 1	3.20	"	—
Miscellaneous No. 2	2.65	"	—
Thirds and Blues—			
Miscellaneous	1.80	"	—
Repacked	2.20	"	—
Black Stockings—			
(Export)	Nominal		
Roofing Stock—			
Foreign No. 1	Nominal		
Domestic No. 1	1.55	"	—
Domestic No. 2	1.45	"	—
Roofing Bagging	1.35	"	—
Old Manila Rope	5.75	"	—

Bagging

(F. o. b. Phila.)

Gunny No. 1—			
Foreign	Nominal		
Domestic	3.00	"	3.50
Sisal Rope	3.75	"	—
Mixed	1.00	"	1.50
Scrap—			
No. 1	3.25	"	3.50
No. 2	1.75	"	1.80
Wool Tares	4.00	"	4.25
No. 1 New Light Burlap	3.00	"	4.00
New Burlap Cuttings	3.75	"	4.00

Old Papers

(F. o. b. Phila)

OPA Maximum Prices

No. 1 Hard White Envelope Cuts, one cut	3.37½	"	—
No. 1 Hard White Shavings, unruled	2.87½	"	—
Soft White Shavings, one cut	2.50	"	—
White Blank News	1.65	"	—
Soft White Shavings, Misc.	2.15	"	—
No. 1 White Ledger	2.17½	"	—
No. 2 Ledger, colored	1.87½	"	—
No. 1 Heavy Books & Magazines	1.67½	"	—
Overissue Magazines	1.67½	"	—
New Manila Envelope Cuttings	2.65	"	—
No. 1 Assorted Old Kraft	1.75	"	—
No. 1 Mixed Paper	.70	"	—
Box Board Cuttings	.72½	"	—
Kraft Corrugated Cuttings	2.25	"	—
Old Corrugated Containers	1.15	"	—
Overissue News	.85	"	—
No. 1 News	1.00	"	—

BOSTON

Old Papers

(F. o. b. Boston)

OPA Maximum Prices

No. 1 Hard White Shavings, unruled	2.87½	●	—
No. 1 Hard White Shavings, ruled	2.50	"	—
Soft White Shavings, Misc.	2.15	"	—
No. 1 Fly Leaf Shavings	1.67½	"	—
No. 2 Fly Leaf Shavings	1.12½	"	—
No. 1 Groundwood Fly Leaf Shavings	1.25	"	—
No. 2 Groundwood Fly Leaf Shavings	.90	"	—
Mixed Colored Shavings	.75	"	—
New Manila Envelope Cuts, one cut	2.87½	"	—
Hard White Envelope Cuts, one cut	3.37½	"	—
Triple Sorted No. 1 Brown Soft Kraft	2.50	"	—
Mixed Kraft Env. & Bag Cuttings	2.75	"	—
Kraft Envelope Cuttings	3.25	"	—
No. 1 Heavy Books & Magazines	1.67½	"	—
New Manila Envelope Cuts, one cut	2.87½	"	—
New Manila Envelope Cuttings	2.65	"	—
White Blank News	1.65	"	—
No. 1 Assorted Old Kraft	1.75	"	—
No. 1 Mixed Paper	.70	"	—
Overissue News	.85	"	—
Box Board Cuttings	.72½	"	—
New Corrugated Cuttings, Kraft	2.25	"	—
Old 100% Kraft Corrugated Containers	1.75	"	—
Old Corrugated Containers	1.15	"	—
Jute Corrugated Cuttings	1.07½	"	—

Bagging

(F. o. b. Boston)

Gunny Bagging—			
Foreign	(nominal)		
Domestic	2.50	●	2.75
Sisal Rope No. 1	*4.75	"	—
Sisal Rope No. 2	*4.25	"	—
Mixed Rope	1.35	"	1.50
Transmission Rope—			
Foreign	(nominal)		
Domestic	2.75	"	3.00
Manila Rope—			
Foreign	(nominal)		
Domestic	5.75	"	—
Soft Jute Rope	5.25	"	—
Jute Carpet Threads	3.00	"	3.50
Bleachery Burlap	8.50	"	9.00
Scrap Burlap—			
Foreign	(nominal)		
Domestic	3.25	"	3.50
Wool Tares—			
Foreign	(nominal)		
Domestic	4.25	"	—
Aust. Wool Pouches	3.75	"	4.00
New Burlap Cuttings	4.75	"	5.00
Heavy Baling Bagging	4.00	"	4.25
Paper Mill Bagging	2.50	"	3.00
No. 2 Bagging	1.35	"	—*

* OPA Maximum Price.

Domestic Rags (New)

(F. o. b. Boston)

Shirt Cuttings—			
New Light Prints	.04½	●	.04¾
Fancy Percales	.04¼	"	.05
New White No 1	.06¾	"	.07
New Light Flannelettes	.05½	"	.06
Canton Flannels, Bleached	.06	"	06¼
Underwear Cutters, Bleached	.06¼	"	06¾
Underwear Cutters, Unbleached	.05¾	"	.06
Silesias No. 1	.06	"	.06¼
New Black Silesias	.03	"	.03½
Red Cotton Cuttings	.03½	"	.04
Soft Unbleached	.06½	"	.06¾
Blue Cheviots	.05½	"	.06
Fancy	.02¾	"	—
Washable	.02¾	"	—
Khaki Cuttings	.02¾	"	.03
O. D. Khaki	.03½	"	.03¾
Corduroy	.03¼	"	.03½
New Canvas	.06¼	"	.06¾
B. V. D. Cuttings	.06¼	"	.06¾

Domestic Rags (Old)

(F. o. b. Boston)

White No. 1—			
Repacked	3.80	●	—*
Miscellaneous	3.20	"	—*
White No. 2—			
Miscellaneous	2.65	"	—*
Twos and Blues, Repacked	2.20	"	—*
Old Blue Overalls	2.25	"	2.50
Thirds and Blues, Repacked	2.20	"	—*
Miscellaneous	1.80	"	—*
Black Stockings	3.50	"	4.00
Roofing Stock—			
No. 1	1.55	"	—*
No. 2	1.45	"	—*
No. 3	1.35	"	—*
No. 4	1.35	"	—*
No. 5, Quality A	1.35	"	—*
Quality B	1.20	"	—*
Quality C	.95	"	—*
* Old Manila Rope	5.75	"	—

* OPA Maximum Prices.

Foreign Rags

(F. o. b Boston)

Canvas	(nominal)
Dark Cottons	(nominal)
Dutch Blues	(nominal)
New Checks and Blues	(nominal)
Old Fustians	(nominal)
Old Linsey Garments	(nominal)
New Silesias	(nominal)

CHICAGO

Waste Paper

(F. o. b. Chicago)

OPA Maximum Prices.

Shavings—			
No. 1 Hard White Envelope Cuts, one cut	3.37½	"	—
No. 1 Hard White Shavings, unruled	2.87½	"	—
No. 1 Soft White Shavings	2.50	"	—
Misc.	2.15	"	—
No. 1 White Ledger	2.17½	"	—
No. 2 Ledger, colored	1.87½	"	—
No. 1 Heavy Books & Magazines	1.67½	"	—
Overissue Magazines	1.67½	"	—
New Manila Envelope Cuttings	2.65	"	—
No. 1 Assorted Old Kraft	1.75	"	—
No. 1 Mixed Paper	.70	"	—
Box Board Cuttings	.72½	"	—
Kraft Corrugated Cuttings	2.25	"	—
Old Corrugated Containers	1.15	"	—
Overissue News	.85	"	—
No. 1 News	1.00	"	—
No. 1 White Ledger	2.17½	"	—
No. 1 Heavy Books & Magazines	1.67½	"	—
White Blank News	1.65	"	—
Mixed Kraft Env. & Bag Cuttings	2.75	"	—
No. 1 Assorted Old Kraft	1.75	"	—
Overissue News	.85	"	—
No. 1 News	.75	"	—
No. 1 Mixed Paper	.70	"	—
No. 1 Roofing Rags	1.55	"	—
No. 1 Roofing Bags	1.45	"	—

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PAPER TRADE JOURNAL

DECEMBER 30, 1943

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Dyestuff Makers Since 1859

With that relentless taskmaster "Production" pressing, pressing, pressing, there were many occasions during 1943 when even the Patience of Job would have been tried.

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And it was just that kind of thoughtfulness that we, also, had a difficult job, which makes us eternally grateful not only for the business with which we were favored but for the peace of mind which you gave us in the process of serving you.

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"BUNDLES FOR AMERICANS"

NOW PRISONERS OF WAR

Standard food packages are stacked like a pile of bricks in a warehouse at Geneva, Switzerland. As soon as the authorities are notified of the capture and locations of Americans, they begin sending them one of these packages every week; each internee receives a package every-other-week. Similar packages are sent to the Far East, as fast as the Japs permit. Each corrugated container holds evaporated milk, biscuit, cheese, cocoa, sardines, pork, beef, chocolate bars, sugar, coffee, powdered orange concentrate, prunes, cigarettes and smoking tobacco. . . . We don't know who made the paperboard shown in this picture, but we do know that with the aid of Downingtown Machinery, board for corrugating is made by our customers listed at the left. . . . Performance of Downingtown Machinery under the stress of wartime conditions is something for every paper and board mill to remember, or investigate, before ordering post-war equipment. . . . Our Engineering Department is at your service NOW. . . . Downingtown Mfg. Company, Downingtown, Pa.

Red Cross Photo from O. W. I.

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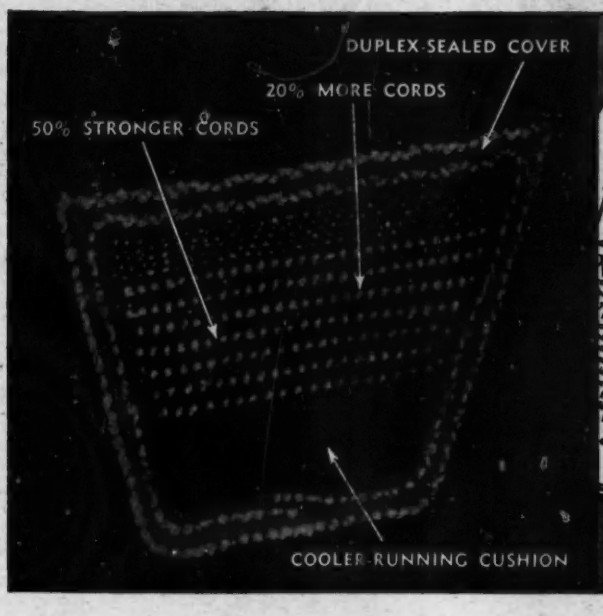
"Make 'em Last!"

(HERE ARE TWO WAYS TO DO IT . . .)



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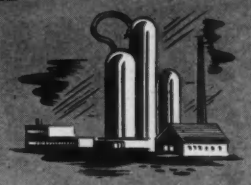
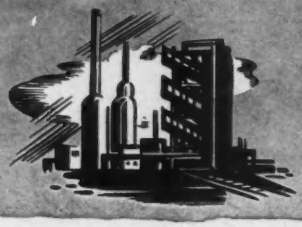
▶ Beckman pioneered the first practical and portable glass electrode equipment for measuring pH. This development has become the foundation for the great modern advancements in pH control of industrial processes. It has made pH control simple, positive, accurate—enabling industry to step up production, reduce waste and make other important economies in production.



▶ Beckman developed the first *fully automatic* glass electrode pH indicator . . . the final link in pH control which enabled the advantages of the glass electrode to be applied to large-scale industrial processes on a completely automatic basis. Today this instrument is essential to the efficient operation of many production processes *—and is the most modern pH instrument available.*

▶ With the development of today's increasingly complex chemical processes, the need arose for faster, simpler methods of analytical control. To meet this need Beckman developed the *Quartz Spectrophotometer* . . . an instrument that embodies many unique advancements and saves many hours in making complicated analytical measurements. Covers the full visible, ultraviolet and near infrared.



▶ Major advancements in petroleum refining—aviation gasoline, synthetic rubber, toluene, etc.—have revolutionized refinery practices, making new methods of control essential. Modern refineries, by using the *Beckman Infrared Spectrophotometer,* are now able to save many hours in complex hydro-carbon analyses, making this instrument one of the key factors in operating today's refining processes.

THIS is but a brief outline of the *many* important advancements in instrumentation pioneered and perfected by the Beckman staff. Perhaps Beckman research and ingenuity in developing advanced instruments for controlling modern industrial processes can help in the solution of *your* instrumentation problem. Why not write our engineering department? *Beckman Instruments, National Technical Laboratories, South Pasadena, California.*

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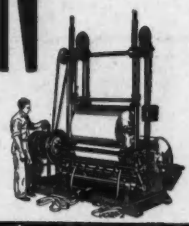

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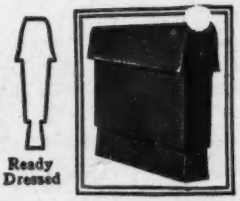

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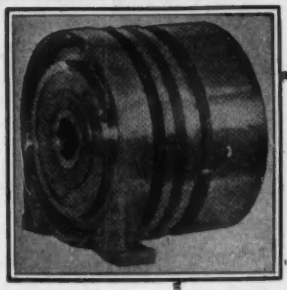

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124. 1—Lawrence—4"—450 g.p.m.—40' head —motor base—no motor.
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128. 1—Worthington — 220 g.p.m.—60' head.
129. 1—Foster-Wheeler Corp.—375 g.p.m. — 65' head.
135. 1—Foster-Wheeler Corp. — 200 g.p.m. — 65' head.
137. 1—Taber Pump Co. — 160 g.p.m. — 30' head.
140. 1—DeLaval—200 g.p.m.—25' head.
142. 1—Worthington 400 g.p.m.—27½' head.
142A. 1—Worthington — 400 g.p.m. — 27½' head.
143. 1—Warren Steam Pump Co.—300 g.p.m. —40' head.
145. 1—Worthington—400 g.p.m.—72' head.
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147A. 2—Franklin Process Co.—open impeller —400 g.p.m.—45' head.
151. 1—Goulds—850 g.p.m.—45' head.
156. 1—Dayton-Dowd Co. — 200 g.p.m. — 50' head.
158. 1—Cameron—425 g.p.m.—296' head.
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169. 1—American—525 g.p.m.—60' head.
170. 1—Morris—1200 g.p.m.—95' head.
171. 1—Goulds—600 g.p.m.—50' head.
172. 1—Goulds—600 g.p.m.—50' head.
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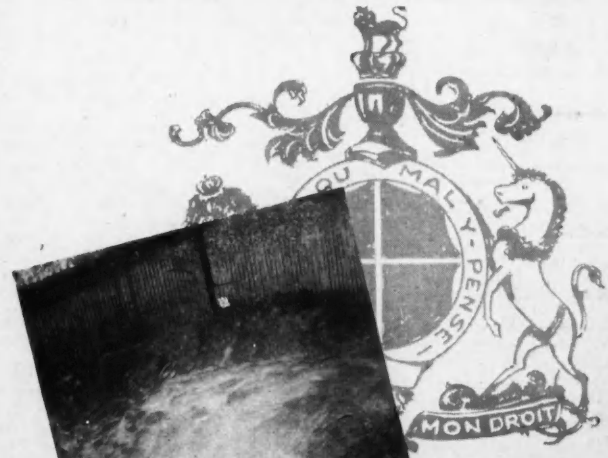

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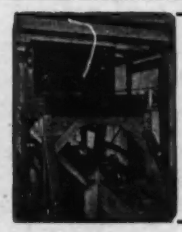

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Weber, H. G., & Company ... 43
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West Virginia Pulp & Paper Co. 39
Weyerhaeuser Timber Co. ..... —
Williams, C. K., & Company.. —
Wishnick Tumpeer, Inc. ..... —
Woods, T. B., Sons Co. ..... —
Woodward-Baldwin Co. ..... —
Wyandotte Chemicals Corp. ... —

WHERE TO BUY

ABRASIVES
The Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc.
Monsanto Chemical
Norton Co.

ADHESIVES
National Starch Products, Inc.
Philadelphia Quartz Co.
Stein, Hall & Co., Inc.

AGITATORS
Appleton Machine Co.
Dilts Machine Works, Inc.
Dorr Company
Improved Paper Machy. Corp.
E. D. Jones & Sons Co.
D. J. Murray Mfg. Co.
Downingtown Mfg. Co.
Montague Machine Co.
Moore & White Co.
Noble & Wood Machine Co.
The Norwood Engineering Company
The H. K. Porter Company
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Valley Iron Works Co.

BAG MACHINES
Thomas W. Hall Co., Inc.
Potdevin Machine Co.
Shartle Brothers Machine Co.
Smith & Winchester Mfg. Co.
Weber, Herman G.

BARKERS AND CHIPPERS
Allis-Chalmers Mfg. Co.
Appleton Machine Co.
Carthage Machine Co.
D. J. Murray Mfg. Co.
Valley Iron Works Co.

BARS
Dilts Machine Works, Inc.
E. D. Jones & Sons Co.
The Moore & White Co.
Noble & Wood Machine Co.
Shartle Brothers Machine Co.
Simonds Worden White Co.
Valley Iron Works Co.

BEARINGS
Bantam Bearings Division, The Torrington Company
Black-Clawson Company
Jones, E. D. & Sons Co.
The Manhattan Rubr. Mfg. Co.
Montague Machine Works
Rollway Bearing Co.
Shartle Brothers Machine Co.
Timken Roller Bearing Co.
Valley Iron Works Co.

BEATERS & JORDANS
The Appleton Machine Co.
Black-Clawson Company
Dilts Machine Works, Inc.
Downingtown Mfg. Co.
E. D. Jones & Sons Co.
Noble & Wood Machine Co.
J. J. Ross Company
Shartle Brothers Machine Co.
Smith & Winchester Mfg. Co.
Valley Iron Works

BED PLATES
American Manganese Steel Division of the Amer. Brake Shoe Co.
Bahr Brothers Mfg. Co.
Dilts Machine Works Inc.
Downingtown Mfg. Co.
Farrel-Birmingham Co., Inc.
E. D. Jones & Sons Co.
Noble & Wood Machine Co.
Shartle Brothers Machine Co.
Simonds Warden White Co.
Valley Iron Works Co.

BELTING
Allis-Chalmers Mfg. Co.
The Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc.
J. E. Rhoads & Sons
Worthington Pump & Machinery Corp

BLEACHING APPARATUS
Improved Paper Machy. Corp.
E. D. Jones & Sons Co.
Perkins & Sons, Inc., B. F.
Moore & White Co.
Niagara Alkali Co.
Noble & Wood Machine Co.
Pennsylvania Salt Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.

BLOWERS
Ingersoll-Rand Co.

BLOW PIPES & PITS
Montague Machine Co.
Moore & White Co.
Murray Mfg. Co., D. J.
Walworth Company
Valley Iron Works Co.

BOTTOMS
Harrington & King Perforating Co.
Kalamazoo Tank & Silo Co.

BUSHINGS
Black-Clawson Company
Manhattan Rubber Mfg. Co. Division of Raybestos-Manhattan, Inc.
The Sandy Hill Iron & Brass Works

CALENDERS
Black-Clawson Company
Downingtown Mfg. Co.
Farrel-Birmingham Co., Inc.
Lobdell Car Wheel Co.
Moore & White Co.
Perkins & Son, Inc., B. F.
The Norwood Engineering Company
J. J. Ross Company
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Smith & Winchester Mfg. Co.
Valley Iron Works
Waldron Corp., John

CASTINGS
American Manganese Steel Division of the Amer. Brake Shoe Co.
Appleton Machine Co.
Black-Clawson Company
Dilts Machine Works
Downingtown Mfg. Co.
Farrel-Birmingham Co.
The Frederick Iron & Steel Co.
Grinnell Company
Hamblet Machine Co.
E. D. Jones & Sons Co.
Lobdell Car Wheel Co.
Montague Machine Co.
Noble & Wood Machine Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Smith & Winchester Mfg. Co.
Union Machine Company
Union Screen Plate Co.
Valley Iron Works Co.
Walworth Company

CENTRIFUGAL MACHINERY
Bird Machine Co.
De Laval Steam Turbine Co.
Nichols Engrg. & Research Corp.
Ross J. O. Eng. Co.
Shartle Brothers Machine Co.

CHEMICALS
Amer. Cyanamid & Chem. Corp.
Ansul Chemical Co.
Atkivin Corporation
Chemical & Pigment Co.
Calco Chemical Co.
Diamond Alkali Co.
Dow Chemical Company
E. I. du Pont de Nemours & Co., Inc.
General Dyestuff Corp.
Geigy Co., Inc.
Gottesman & Co.
Heyden Chemical Works
Hooker Electrochemical Company
Kali Manufacturing Co.
Monsanto Chemical Company
The Neville Company
Niagara Alkali Company
Paper Makers Chemical Department, Hercules Powder Co.
Pennsylvania Salt Mfg. Co.
Pittsburgh Plate Glass Co., Columbia Chemical Division
Solvay Sales Corp.
Stauffer Chemical Company
Wishnick-Tumpeer, Inc.
Wyandotte Chemicals Corp.

CLEANING MATERIALS
Amer. Cyanamid & Chem. Corp.
Bird Machine Co.
E. I. du Pont de Nemours & Co., Inc.
Paper Makers Chemical Department, Hercules Powder Co.
Nichols Engrg. & Research Corp.
Pennsylvania Salt Mfg. Co.
Philadelphia Quartz Co.
Pittsburgh Plate Glass Co., Columbia Chemical Division
Solvay Sales Corp.
Wyandotte Chemicals Corp.
J. B. Ford Division

CLUTCHES
Appleton Machine Co.
Black-Clawson Company
Hudson Sharp Machine Company
Farrel-Birmingham Co.
Rodney Hunt Machine Co.
Moore & White Co.
D. J. Murray Mfg. Co.
The Sandy Hill Iron & Brass Works
Stearns Magnetic Mfg. Co.
Valley Iron Works Co.

COATING MACHINERY
Hudson Sharp Machine Company
Moore & White Co.
Potdevin Machine Co.
Shartle Brothers Machine Co.
Waldron Corporation, John
Weber, Herman G.

COATING RAW MATERIALS
The Neville Company

COCKS
Shartle Brothers
Walworth Company
Valley Iron Works Co.

COMPRESSORS
Allis-Chalmers Mfg. Co.

WHERE TO BUY

De Laval Steam Turbine Co.
Ingersoll-Rand Co.
Nash Engineering Co.
Worthington Pump & Machinery Corp.

CONSULTING ENGINEERS
W. H. L. D. Betz
Ferguson, Hardy S.
Hardy, George F.
Johnson & Wierk, Inc.
Merritt-Chapman & Scott Corp.
Main, Inc., Chas. T.
O'Donoghue, Roderick
J. E. Sirrine & Co.
Stone & Webster Engrg. Corp.

CONDENSERS
Ingersoll-Rand Co.

CONVEYORS
Black-Clawson Company
Murray, D. J. Mfg. Co.
Ross Engineering Corp., J. O.

COOKING PROCESSES
Kinsley Chemical Co.

CORES
Elixman Paper Co.
Sonoco Products Co.
Rodney Hunt Machine Co.
Montague Machine Co.
Smith & Winchester Mfg. Co.

COUPLINGS
Black-Clawson Company
De Laval Steam Turbine Co.
Farrel-Birmingham Co., Inc.
The Frederick Iron & Steel
E. D. Jones & Sons Co.
Moore & White Co.
Noble & Wood Machine Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Valley Iron Works Co.
Waldron Corp., John
Westinghouse Electric Mfg. Co.

CUTTERS
Thomas W. Hall Co.
Noble & Wood Mch. Co.
Perkins & Son, Inc., B. F.
The Smith & Winchester Mfg. Co.
Taylor Stiles & Co.

DAMPENERS
The Norwood Engineering Company
Perkins & Son, Inc., B. F.
Valley Iron Works Co.

DE-COLORIZING
Kinsley Chemical Co.

DE-INKING
Kinsley Chemical Co.
O'Donoghue, Roderick

DIGESTERS
The H. K. Porter Company
Pusey & Jones Corp.

DOCTORS
Bird Machine Company
Black-Clawson Company
Downingtown Mfg. Co.
Lobdell Carwheel Co.
Montague Machine Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.

DOCTOR BLADES
Black-Clawson Company
Cincinnati Rubber Mfg. Co.
The Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc.
Montague Machine Co.
The Sandy Hill Iron & Brass Works
Simonds Worden White Co.
Shartle Brothers
Westinghouse Electric & Manufacturing Company

DRIERS
Black-Clawson Company
Murray Mfg. Co., D. J.
J. J. Ross Company
Ross, J. O. Engineering Corp.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Valley Iron Works Co.
Waldron, Corp., John

DRIVES AND DRIVE STANDS
Allis-Chalmers Mfg. Co.
Bird Machine Co.
Black-Clawson Company
Davis, Frank H., Co.
Dilts Machine Works
Downingtown Mfg. Co.
Farrel-Birmingham Co.
General Electric Company
Montague Machine Co.
Moore & White Co.
Murray, D. J. Mfg. Co.
Noble & Wood Machine Co.
Norwood Engrg. Co.
Pusey Jones Corp.
J. J. Ross Company
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Valley Iron Works Co.
Westinghouse Electric & Manufacturing Company

DRUMS
Stearns Magnetic Mfg. Co.
Waldron Corp., John

DUSTERS
Appleton Machine Co.
Downingtown Mfg. Co.
E. D. Jones & Son Co.
Moore & White Co.
Noble & Wood Machine Co.
Norwood Engrg. Co.
D. J. Murphy Mfg. Co.

DYESTUFFS
Calco Chemical Co.
Ciba Company
E. I. du Pont de Nemours & Co.
Geigy Co., The
General Dyestuff Corp.
Glidden Company
National Aniline Division, Allied Chemical & Dye Corp.
Paper Makers Chemical Department, Hercules Powder Co.
C. K. Williams & Co.
Wishnick-Tumpeer, Inc.

ELECTRIC EQUIPMENT
Allis-Chalmers Mfg. Co.
General Electric Co.
Reliance Electric & Mfg. Co.
Westinghouse Electric & Manufacturing Company

EVAPORATORS
Black-Clawson Company
Murray, D. J., Mfg. Co.

EXTRACTORS
Bird Machine Company
Dilts Machine Works
Downingtown Manufacturing Co.
E. D. Jones & Sons Co.
The Noble & Wood Machine Co.
Valley Iron Works Co.

FANS
General Electric Co.
B. F. Perkins & Son, Inc.
Ross Engineering Co., J. O.

FEEDERS
Merrick Scale Mfg. Co.
Leeds & Northrup
Permutit Company
Wallace & Tiernan

FELTS
Appleton Woolen Mills
Asten-Hill Mfg. Co.
Bloomfield Woolen Co.
Draper Bros. Co.
Fitchburg Duck Mills
Huyck & Son, F. C.
Knox Woolen Co.
Lockport Felt Co.
Mt. Vernon-Woodbury Mills, Inc.
Morey Paper Mill Supply Co.
Orr Felt & Blanket Co.
Shuler & Benninghofen
Turner Halsey & Co.
Waterbury Felt Co.

FELT GUIDES
Moore & White Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Waldron Corp., John

FILLERS
American Colloid Co.
Amer. Cyanamid & Chem. Corp.
International Pulp Co.
W. H. Loomis Talc Corp.
Vanderbilt Co., R. T.
Wishnick-Tumpeer, Inc.

FILTERS
Improved Paper Machy. Corp.
Moore & White Co.
The Norwood Engineering Company
The Permutit Company
J. O. Ross Engrg. Corp.
Union Talc
Worthington Pump & Mchy. Corp.
Wishnick-Tumpeer, Inc.

FITTINGS
Black-Clawson Company
Grinnell Company
Murray, P. J., Co.
Shartle Brothers Machine Co.
Walworth Company

FLOORING, GRATING & TREADS
Hendrick Mfg. Co.
Klemp, W. F., Co.
Norton Co.
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc.
Robinson, C. P.

FORMING MACHINES
Downingtown Mfg. Co.
Improved Paper Machy. Corp.
Noble & Wood Machine Co.
Oliver United Filters
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.

GATES (Penstocks and water wheels)
Rodney Hunt Machine Co.

GEARS
American Manganese Steel Div. of the Amer. Brake Shoe Co.
Black-Clawson Company
De Laval Steam Turbine Co.
Downingtown Mfg. Co.
Farrel-Birmingham Co.
E. D. Jones & Sons Co.
Moore & White Co.
D. J. Murray Mfg. Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Smith & Winchester Mfg. Co.
Valley Iron Works Co.
Waldron Corp., John

GENERATORS
Ingersoll-Rand Co.

GRINDERS
Covel-Hanchett Co.
Farrel-Birmingham Co.
Lobdell Car Wheel Co.
Montague Machine Co.
Samuel C. Rogers and Company
The Sandy Hill Iron & Brass Works

GRINDING WHEELS
The Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc.
Simonds Worden White Co.

HANGERS
Black-Clawson Company
Grinnell Company
Walworth Company

HEATING, VENTILATING AND AIR CONDITIONING
The Appleton Machine Co.
Armstrong Machine Works
Dravo Corporation
E. D. Jones & Sons Co.
General Electric Co.
Grinnell Company
Leeds & Northrup
D. J. Murray Mfg. Co.
Noble & Wood Machine Co.
Ross Engineering Corp., J. O.
Shartle Brothers Machine Co.
Valley Iron Works Co.
Worthington Pump & Mchy. Corp.

HEAT-TREATING FURNACES
Leeds & Northrup Company

HOISTS
Appleton Machinery Co.
Dilts Machine Works
Rodney Hunt Machine Co.
Ingersoll-Rand Co.
E. D. Jones & Sons Co.

HOSE (Air, Water, Suction, etc.)
Cincinnati Rubber Mfg. Co.
The Manhattan Rubber Manufacturing Division of Raybestos-Manhattan Inc.

INDICATORS AND INSTRUMENTS
N. P. Bowsher
The Foxboro Company
General Electric
Leeds & Northrup Company
National Technical Laboratories
The Permutit Company
Taylor Instrument Cos.
Westinghouse Electric & Manufacturing Company

JORDAN FILLINGS
Appleton Machine Co.
Bahr Brothers Mfg. Co.
E. D. Jones & Sons Co.
Noble & Wood Machine Co.
Shartle Brothers Machine Co.
Smith & Winchester Mfg. Co.
Valley Iron Works Co.

KNIVES
Black-Clawson Company
Dilts Machine Works, Inc.
Hamblet Machine Co.
Heppenstall Co.
E. D. Jones & Sons Co.
Simonds Worden White Co.
Valley Iron Works Co.

LABORATORY EQUIPMENT
Appleton Machine Co.
W. H. & L. D. Betz
Dilts Machine Works
E. D. Jones & Sons Co.
LaMotte Chemical Products Company
Leeds & Northrup Company
National Technical Laboratories
Noble & Wood Machine Co.
Taylor Instrument Companies
Testing Machines, Inc.
Valley Iron Works Co.

LAY BOYS
Hamblet Machine Co.
Moore & White Co.
Shartle Brothers

LOCOMOTIVES
The H. K. Porter Company

LUBRICANTS
Gulf Oil Corporation
Gulf Refining Co.
Sinclair Refining Co.
Socony-Vacuum Oil Co., Inc.
Sun Oil Company
Tide Water Associated Oil Co.

METERS
The Brown Instrument Co.
The Foxboro Company
Leeds & Northrup Company
Mason-Neilan Regulator Co.
Merrick Scale Co.
National Technical Laboratories
Permutit Co.
Taylor Instrument Companies
Westinghouse Electric & Manufacturing Company

MICROMETERS & CALIPERS
Farrel-Birmingham Co.
Montague Machine Co.
Lobdell Car Wheel Co.

MOTORS AND GENERATORS
Allis-Chalmers Mfg. Co.
De Laval Steam Turbine Co.
General Electric Co.
Westinghouse Electric & Manufacturing Company

PACKING BOXES
Johnson Corporation
Shartle Brothers Machine Co.

PACKING
Cincinnati Rubber Mfg. Co.
The Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc.

PADDLES
Bahr Brothers Mfg. Co.
Shartle Brothers Machine Co.
Valley Iron Works Co.

PAPER MACHINES
Black-Clawson Company
Downingtown Mfg. Co.
Thomas W. Hall Co.
Moore & White Co.
Pusey & Jones
L. J. Ross Company
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Smith & Winchester

PAPER MACHINE HOODS
Ross Engineering Corp., J. O.

PAPER MACHINE SLICES
Black-Clawson Company
E. D. Jones & Sons Co.
Montague Machine Co.
The Sandy Hill Iron & Brass Works
Valley Iron Works Co.

PAPER TUBE MACHINERY
Dietz Machine Works
Thomas W. Hall Co.
Hudson Sharp Machine Company
Langston Co., Samuel M.

PASTING MACHINES
Black-Clawson Company
Davis, Frank H., Co.
Murray, D. J., Mfg. Co.
Moore & White Co.
Potdevin Machine Co.
Shartle Brothers Machine Co.
Waldron Corp., John

PERFORATED METAL
Allis-Chalmers Mfg. Co.
Harrington & King Perforating Co.
Hendrick Mfg. Co.

PIPE
The American Rolling Mill Co.
Black-Clawson Company
Grinnell Company
Shartle Brothers Machine Co.
Taylor Forge & Pipe Works
Walworth Company

PLATERS
The Norwood Engineering Company
Perkins & Son, Inc., B. F.

PLATES
The American Rolling Mill Co.
Black-Clawson Company
Ingersoll Steel & Disc Division, Borg Warner Corp.
Klemp, W. F., Co.
Robinson, C. P.
Shartle Brothers Machine Co.
Timken Roller Bearing Co.

PLUGS
Black-Clawson Company
E. D. Jones & Sons Co.
The Noble & Wood Machine Co
The Richardson Economy Plug Co.
Shartle Brothers Machine Co.

PRESSES
Black-Clawson Company
Farrel-Birmingham Co.
Dietz Machine Wks.
Thomas W. Hall Co.
Hudson-Sharp Machine Co.
Paper Converting Machine Co., Inc.
Potdevin Machine Co.
Shartle Brothers
Valley Iron Works Co.
Waldron Corp., John
Weber, Homer G.

PULLEYS AND SHAFTS
Allis-Chalmers Mfg. Co.
Black-Clawson Company
Downingtown Mfg. Co.
E. D. Jones & Son Co.
Montague Machine Co.
D. J. Murray Mfg. Co.
The Noble & Wood Machine Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Stearns Magnetic Mfg. Co.
Valley Iron Works Co.
T. B. Wood's Sons Company

PULPS
Andersen Co., J.
Gottesman & Co., Inc.
Perkins-Goodwin Co.
Price & Pierce, Ltd.
Pulp and Paper Trading Co.

PUMPS
Allis-Chalmers Mfg. Co.
American Manganese Steel Div. of the Amer. Brake Shoe Co.

WHERE TO BUY

Black-Clawson Company
Dorr Company
Downingtown Mfg. Co.
De Laval Steam Turbine Co.
Frederick Iron and Steel Co.
Ingersoll-Rand Co.
Johnson Corp.
Moore & White Co.
Nash Engineering Co.
Noble & Wood Machine Co.
Paper Converting Mch. Co.
Quimby Pump Co. Div. of H. K. Porter Company, Inc
J. J. Ross Company
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Smith & Winchester Mfg. Co.
Warren Steam Pump Co.
Worthington Pump & Machinery Corp.

RAG THRASHERS
The Norwood Engineering Company

REAM COUNTERS
Hamblet Machine Co.

RECOVERY SYSTEMS
Rodney Hunt Machine Co.
Moore & White Co.
D. J. Murray Mfg. Co.
Pusey & Jones
Ross Engineering Corp, J. O.
Valley Iron Works Co.

REELS
Black Clawson Company
Downingtown Mfg. Co.
De Laval Steam Turbine Co.
Hudson Sharp Machine Company
Montague Machine Co.
Moore & White Co.
Paper Converting Mch. Co.
Rodney Hunt Machine Co.
The Norwood Engineering Company
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
The Smith & Winchester Mfg. Co.

REFINERS
Appleton Machine Co.
Bahr Brothers Mfg. Co.
Bauer Brothers Co.
Dilts Machine Works
E. D. Jones & Sons Co.
Murray, D. J. Mfg. Co.
Noble & Wood Machine Co.
Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Valley Iron Works

REGULATORS AND CONTROLLERS
Allis-Chalmers Mfg. Co.
Armstrong Machine Works
Bird Machine Company
The Brown Instrument Co.
The Foxboro Company
Jones, E. D., & Sons Co.
General Electric Co.
Johnson Corp.
Leeds & Northrup Company
Mason-Neilan Regulator Co.
National Technical Laboratories
Noble & Wood Machine Co.
Shartle Brothers
Permutit Co.
Taylor Instrument Companies
Wallace & Tiernan
Westinghouse Electric & Manufacturing Company

RESEARCH
Cellulose Products Laboratory du Pont, E. I.

RESINS
The Neville Company
The Resinous Products & Chemical Co.

ROLLS
Appleton Machine Co.
Black-Clawson Company
Cincinnati Rubber Mfg. Co.
Downingtown Mfg. Co.
Farrel-Birmingham Co.
Improved Paper Machy. Corp.
Lobdell Co.
The Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc.
Montague Machine Co.
D. J. Murray Mfg. Co.
Noble & Wood Machine Co.
The Norwood Engineering Company
Perkins, B. F., & Sons Co.
Pusey & Jones Corp.
Roehlen Engraving Co.
J. J. Ross Company
Rodney Hunt Machine Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Sinclair Co.
Smith & Winchester Mfg. Co.
Stearns Magnetic Mfg. Co.
Valley Iron Works Co.
Waldron Corp., John

ROLL STANDS
Cameron Machine Co.
Improved Paper Machy. Corp.
Johnstone Eng. & Machine Co.
Moore & White Co.
Potdevin Machine Co.
Shartle Brothers Machine Co.

SATURATING MACHINES
Black-Clawson Company
Moore & White Co.
Noble & Wood Machine Co.
Potdevin Machine Co.
Shartle Brothers Machine Co.
Waldron Corp., John
Weber, Herman G.

SCALES
Merrick Scale Mfg. Co.
Testing Machines, Inc.

SCREEN DIAPHRAGMS
Cincinnati Rubber Mfg. Co.
E. D. Jones & Sons Co.
The Manhattan Rubber Manufacturing Division of Raybestos-Manhattan, Inc.
The Sandy Hill Iron & Brass Works
Valley Iron Works Co.

SCREEN PLATES
Fitchburg Screen Plate Co.
Morey Paper Mill Supply Co.
Union Machine Co.
Union Screen Plate Co.

SCREENS
Allis-Chalmers Mfg. Co.
Appleton Wire Works
Appleton Machine Co.
Bird Machine Company
Carthage Machine Co.
Dilts Machine Works, Inc.
Downingtown Mfg. Co.
Harrington & King Perforating Co.
Hendrick Manufacturing Co.
Improved Paper Machy. Corp.
E. D. Jones & Sons Co.
Montague Machine Co.
Moore & White Co.
D. J. Murray Mfg. Co.
J. J. Ross Company
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Valley Iron Works Co.

SHEET MACHINES
Thomas W. Hall Co.
Noble & Wood Machine Co.
Testing Machines, Inc.
Valley Iron Works Co.

SHELLS (Jordan)
E. D. Jones & Sons Co.
Noble & Wood Machine Co.

SHOWER PIPES
Bird Machine Company
Downingtown Mfg. Co.
Improved Paper Machy. Corp.
Moore & White Co.
Shartle Bros. Mach. Co.
Smith & Winchester Mfg. Co.

SHREDDERS
Bauer Brothers Co.
Carthage Machine Co.

SILICATE OF SODA
Philadelphia Quartz Co.

SIZING
American Cyanamid & Chemical Co.
Black-Clawson Company
The Dow Chemical Co.
du Pont, E. I., de Nemours & Co.
Glidden Company
Paper Makers Chemical Department, Hercules Powder Co.
Socony-Vacuum Co.
Philadelphia Quartz Co.

SIZING PROCESS
Process Engineers

SLIME ELIMINATION
The Dow Chemical Co.
E. I. DuPont de Nemours & Co.
Grasselli Chemicals Dept.
Monsanto Chemical Company
Wallace & Tiernan Co., Inc.

SLITTERS & CUTTERS
Black-Clawson Company
Cameron Machine Co.
Dietz Machine Works
Downingtown Mfg. Co.
Thomas W. Hall Co., Inc.
Hamblet Machine Co.
Hudson Sharp Machine Company
Johnstone Eng. & Machine Co.
Langston Co., Samuel M.
Moore & White Co.
Potdevin Machine Co.
J. J. Ross Company
The Sandy Hill Iron & Brass Works
Simonds Worden White Co.
Smith & Winchester Mfg. Co.
Waldron Corp., John

SOLVENTS
The Neville Company

SORTING TABLES
Moore & White Co.

SPECIAL MACHINERY
Appleton Machine Co.
Downingtown Mfg. Co.
Farrell-Birmingham Co.
Hamblet Machine Co.
Hudson Sharp Machine Company
Improved Paper Machy Corp.
E. D. Jones & Sons Co.
Merrick Scale Mfg. Co.
Montague Machine Co.
D. J. Murray Mfg. Co.
Noble & Wood Machine Co.
The Norwood Engineering Company
Paper Converting Machine Co., Inc.
Potdevin Machine Co.
Rodney Hunt Machine Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
The Smith & Winchester Mfg. Co.
Valley Iron Works Co
Waldron Corp., John

STARCH
American Cyanamid & Chemical Corp.
Clinton Co.
National Starch Products, Inc.
Stein, Hall & Co., Inc.

STEAM SPECIALTIES
Johnson Corp.
The Permutit Company
Shartle Bros. Mch. Co.
Stickle Steam Specialties Co.

STEEL PLATE CONSTRUCTION
Hendrick Mfg. Co.
Ross Engrg. Corp., J. O.

STRAPPING & STRAPPING MACHINES
Acme Steel Co.
Stanley Steel Wks.

STUFF CHESTS
Downingtown Mfg. Co.
E. D. Jones & Sons Co.
Moore & White Co.
D. J. Murray Mfg. Co.
Noble & Wood Machine Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Valley Iron Works Co.

SUCTION BOXES
Black-Clawson Company
Downingtown Mfg. Co.
E. D. Jones & Sons Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.

SUCTION BOX COVERS
Black-Clawson Company
E. D. Jones & Sons Co.
Moore & White Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Westinghouse Electric & Manufacturing Company

SULPHUR
American Cyanamid & Chemical Corp.
Stauffer Chemical Company
Texas Gulf Sulphur Co.
Wishnick-Tumpeer, Inc.

SULPHUR BURNERS
Valley Iron Works Co.

SULPHUR DIOXIDE
Ansul Chemical Company
Virginia Smelting Co.

TALC
W. H. Loomis Talc Corp.
Union Talc Company

TANKS
Hendrick Mfg. Co.
E. D. Jones & Sons Co.
Kalamazoo Tank & Silo Co.
The Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc.
The Noble & Wood Machine Co.
The H. K. Porter Company
Rodney Hunt
J. O. Ross Engrg. Corp.
Shartle Brothers Machine Co.
Waldron Corp., John

TESTERS
Perkins & Son, Inc., B. F.
Testing Machines, Inc.
W. & L. E. Gurley
W. H. & L. D. Betz
Leeds & Northrup Company
National Technical Laboratories
The Permutit Company
Wallace & Tiernan Co., Inc.

THICKENERS, DECKERS & SAVEALLS
Bird Machine Company
Carthage Machine Co.
Dilts Machine Works
Dorr Co.
Downingtown Mfg. Co.
Improved Paper Mchy. Corp.
Montague Machine Co.
Moore & White Co.
D. J. Murray Mfg. Co.
J. J. Ross Company
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Valley Iron Works Co.

TITANIUM
Krebs Pigment and Color Corp.
Chemical & Pigment Co.
Titanium Pigment Co.
United Color & Pigment Co.
R. T. Vanderbilt Co.
Wishnick-Tumpeer, Inc.

TOOLS
Acme Steel Company
Ingersoll-Rand Co.
Stanley Steel Wks.
Walworth Company

TRANSMISSION MACHINERY
Allis-Chalmers Mfg. Co.
Appleton Machine Co.
Black-Clawson Company
De Laval Steam Turbine Co.
Rodney Hunt Mach. Co.
Farrel-Birmingham Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Timken Roller Bearing Co.
Westinghouse Elec. & Mfg. Co.
Worthington Pump & Machinery Corp.
Valley Iron Works Co.

TRAPS
Armstrong Machine Works
Crane Co.
Grinnell Company
Johnson Corporation
Shartle Bros. Mch. Co.

TRIMMERS
The Smith & Winchester Mfg. Co.

TUBS
Noble & Wood Machine Co.
Rodney Hunt Machine Co.
Shartle Brothers
Valley Iron Works Co.

TURBINES
Allis-Chalmers Mfg. Co.
De Laval Steam Turbine Co.
General Electric Company
Hunt, Rodney, Mach. Co.
Westinghouse Electric & Manufacturing Company
Worthington Pump & Machinery Corp

USED EQUIPMENT
Frank H. Davis Company
Gibbs-Brower Co.
Thomas W. Hall Co.
Noble & Wood Machine Co.
J. J. Ross Company
Shartle Brothers Machine Co.

VALVES
Dilts Machine Works
The Foxboro Company
E. D. Jones & Sons Co.
D. J. Murray Mfg. Co.
Noble & Wood Machine Co.
The Permutit Company
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Taylor Instrument Companies
Valley Iron Works Co.
Walworth Company

VATS & VAT PARTS
Union Machine Co.
Union Screen Plate Co.

WASHERS
Bird Machine Company
Downingtown Mfg. Co.
E. D. Jones & Sons Co.
Moore & White Co.
Noble & Wood Machine Co.
The Sandy Hill Iron & Brass Works
Rodney Hunt Machine Co.
Shartle Brothers Machine Co.
Valley Iron Works Co.

WATER CONDITIONING EQUIPMENT
The Permutit Company
Worthington Pump & Machinery Corp

WATERPROOFING CHEMICALS
The Neville Company

WAXES
Pennotex Oil Corp.

WAXING MACHINERY
Black-Clawson Co.
Potdevin Machine Co.
Shartle Brothers Machine Co.
Waldron Corp., John
Weber, Herman G.

WELDING EQUIPMENT
Allis-Chalmers Mfg. Co.
General Electric Company
Walworth Company
Westinghouse Electric & Manufacturing Company

WET MACHINES
Black-Clawson Co.
Carthage Machine Co.
Downingtown Mfg. Co.
Improved Paper Machy. Corp.
Moore & White Co.
Montague Machine Co.
Noble & Wood Machine Co.
Pusey & Jones Corp.
J. J. Ross Company
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Smith & Winchester Mfg. Co.
Valley Iron Works Co.

WINDERS AND REWINDERS
Black-Clawson Company
Cameron Machine Co.
Dietz Machine Works
Downingtown Mfg. Co.
Thomas W. Hall Co.
Hudson-Sharp Mach. Co.
Langston Co., Samuel M.
Johnstone Eng. & Machine Co.
Montague Machine Co.
Moore & White Co.
Paper Converting Mch. Co.
Potdevin Machine Co.
Pusey & Jones Corp.
J. J. Ross Company
The Sandy Hill Iron & Brass Works
Smith & Winchester Mfg. Co.
Waldron Corp., John

WIRES
Appleton Wire Works
Black-Clawson Company
Cheney Bigelow Wire Works
Hayden Wire Works
International Wire Works
Lindsay Wire Weaving Co.
Shartle Brothers Machine Co.

WOOD SPLITTERS
Carthage Machine Co.
D. J. Murray Mfg. Co
Moore & White Co.
Valley Iron Works Co.

As our armed forces advance island after island in the South Pacific, on each of these stepping stones to Tokio, they encounter an enemy more dangerous than the treacherous Japs.

It is water-borne disease. In past wars this killer has caused more casualties than the most deadly weapons devised by man!

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These needs take a great deal of the Penn Salt output of chlorine and chlorine compounds. However, our concentration on this urgent wartime service has provided us with a fund of experience and increased facilities which will be turned to serving our peacetime customers even more satisfactorily when the war is won.

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for the Paper and Pulp Industry

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Alum • Sodium Aluminate
Bleaching Powder • Anhydrous and
Aqua Ammonia • Acids • Perchloron*

*Trade-mark Reg. U. S. Pat. Off.

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